This report is prepared in advance of the annual meeting of the North Central Weed Control Conference. It consists of abstracts and summaries of recent research on many phases of weed control and represents the combined efforts of 147 individual contributors and the members of the Research Committee. It is intended to serve as a timely source of information for persons engaged in research, extension, regulatory and industrial work and others interested in weed control. G. F. Warren, Chairman, Research Committee

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TABLE OF CONTENTS

Page

Indexes
- Author I
- Herbaceous Weeds IV
- Woody Plants VIII
- Crops IX
- New Herbicides XI

Control of Perennial Herbaceous Weeds
- Quack or Couch Grass 1
- Johnson Grass 12
- Leafy Spurge 15
- Field Bindweed 19
- Canada and Perennial Sow Thistle 23
- Hoary Cress, Russian Knapweed, Toadflax and All Other Upland Perennial Herbaceous Weeds 27

Control of Other Herbaceous Weeds
- Annual, Winter Annual and Biennial Grassy and Broadleaved Weeds 33
- Classification of Annual and Biennial Weeds 45
- Aquatic Weeds 50

Control of Woody Plants 51

Control of Weeds in Field Crops
- Spring Sown Grain 73
- Fall Sown Grain 85
- Flax 86
- Corn 93
- Sorghum 98
- Soybeans and Peas 100
- Leguminous Forages 107
- Pastures 116

Control of Weeds in Other Crops
- Onions, Potatoes and Sweet Corn 119
- Other Vegetable Crops 126
- Fruits and Ornamentals 135
- Sugar Beets 139
- Turf 142

Defoliants, Desiccants and Pre-harvest Weed Control 144

New Herbicides 151

Basic Studies 155

Mechanical Considerations 162

AUTHOR INDEX

Author	Page
Alban, E. K.	119, 126, 127, 128, 129
Anderson, C. J.	143
Andersen, R. N.	102
Andersen, E. T.	40, 41, 103, 104, 140
Anderson, L. E.	37, 95, 147
Arend, John L.	52
Bakke, A. L.	87, 96, 139
Bateman, H. P.	162
Behrens, Richard	155, 160
Benfield, P. L.	146
Bestrop, A. J.	8, 15, 25, 26, 28, 29, 31, 41, 65 66, 67, 68, 91, 92, 116
Bohmont, D. W.	23, 33
Bolton, J. L.	108
Breakey, W. J.	19
Brown, D. A.	2, 74, 87, 108
Buchholtz, K. P.	10, 94, 108, 155, 156, 160
Burrows, V. D.	3, 43, 74, 75, 87, 88, 112
Burt, E. O.	7, 12, 13, 24, 100, 109
Campbell, Mac A.	59
Carder, A. C.	1, 3
Carter, J. L.	149
Casady, A. J.	146, 147
Chubb, W. O.	88
Churchill, B. R.	101, 110, 115
Collins, E. V.	162, 163, 164
Cooper, G. S.	145
Corns, W. G.	4, 34, 38, 158
Coupland, Robert T.	27, 35, 36, 37, 75, 76, 77, 88, 89, 108
Craig, H. A.	17, 43, 83, 90
Dabbs, D. H.	120
Darrow, R. A.	53
Davidson, J. G.	84
Davies, Frank F.	99
Day, M. W.	53, 54
Denison, E. L.	135, 136
Derscheid, Lyle A.	5, 15, 17, 28
Dorschner, K. P.	156
Dreessen, Jack	43, 54, 55, 99
Durham, R. S.	6, 9, 33, 37, 45, 95, 111, 147
Dutton, W. C.	151
Ebell, L. F.	38, 39
Elder, W. C.	44, 54, 55, 98, 99
Ellis, N. K.	124
Failes, G. D.	161
Finnerty, Deane W.	82, 102
Fisher, C. E.	68, 70
Foster, J. Roe	23
Forsberg, D. E.	111
Frank, Peter	160
Franklin, W. W.	146

Freeman, J. F. 85, 94, 95, 102, 111, 130, 158
Freeman, J. A. 129
Friesen, Geo. 79, 112
Friesen, H. A. 6, 26, 29, 30, 77, 78, 111, 118, 120
Garvin, J. W. 32
Gassaway, J. E. 13, 20, 21, 99
Gilbert, F. A. 136
Gillies, A. 159
Gleason, L. S. 55
Gries, G. A. 14
Grigsby, Buford H. 31, 50, 101, 110, 140, 142
Hamilton, K. C. 94
Hansen, Henry L. 51
Hansen, J. R. 85, 94, 95, 102, 111, 130, 158
Hanway, D. G. 102
Hauser, Ellis W. 39, 157
Heggeness, H. G. 37,161
Helgeson, E. A. 139
Heltsley, J. R. 40
Hemphill, D. D. 102, 130, 135, 137
Hill, G. D. 7, 24, 25, 43
Hill, D. J. 83
Hilton, R. J. 158
Holm, L. G. 123, 124, 126, 130, 131, 136
Howat, M. G. 158
Howden, J. S. 69, 118
Ilnicki, Richard D. 95, 100, 103, 140
Janzen, P. J. 84
Jokela, J. J. 55, 59
Josephson, L. M. 158
Keys, C. H. 26, 29, 30
Klingman, Dayton L. 116
Knowles, Geo. 79
Kuntz, J. E. 56, 57, 58
L'Arrivee, J. C. M. 40, 41, 103, 104, 140
Lana, E. P. 120, 131
Lantz, H. L. 143
Larsen, John 120, 124, 125
Larsen, A. H. 37
Larsen, R. E. 162
Lee, Oliver C. 12, 13, 14, 104, 143
Le Tourneau, Duane 161
Loomis, W. E. 7, 10, 155
Lorenz, Ralph W. 55, 59
Lovely, W. G. 162, 163, 164
MacKey, E. M. 88
McCully, W. G. 53
McCurdy, E. V. 27, 29, 79
MacDonald, W. P. 41, 90, 91, 144
Mahlstede, J. P. 138
Melander, L. W. 59
Miller, John H. 107, 111
Nelson, Russel T. 141
Nichols, J. M. 60
Nylund, R. E. 119, 121

Ogden, D. B. 139
Olson, P. J. 3, 43, 73, 74, 75, 79, 87, 88, 112
Owens, Clarence B. 61, 62
Oyer, E. B. 14
Pavlychenko, T. K. 8, 15, 16, 25, 26, 27, 28, 29, 31, 41
42, 63, 64, 65, 66, 67, 68, 80, 81, 91, 92, 105, 113, 116, 122
Phillips, W. M. 68, 70, 85, 146, 147
Pickard, George E. 164
Playfair, L. G. 9, 69
Rea, Homer E. 13, 20, 21
Riker, A. J. 56, 57, 58
Robinson, R. G. 6, 9, 86, 95, 147
Roe, Eugene L. 71, 72
Roth, Lawrence O. 165
Rud, O. E. 9
Russ, O. G. 22
Shadbolt, C. A. 123, 124
Shafer, Neal E. 69, 82, 147, 148
Silversides, W. H. 90
Slife, F. W. 40, 96, 100, 105, 149, 150
Slough, A. T. 41, 90, 91
Staniforth, D. W. 87, 96, 106, 120, 139, 163, 164
Steinbauer, G. P. 160
Taylor, D. K. 83, 92, 97, 106
Tibbits, T. W. 131
Walter, C. 143
Warren, G. F. 120, 124, 125, 133
Warren, J. C. R. 159
Watson, W. D. 10, 32
Waywell, C. G. 16, 17, 114
Weber, C. R. 106
Whitfield, Charles J. 13, 20, 21, 99
Wiese, A. F. 6, 9, 95, 147
Willard, C. J. 7, 12, 13, 24, 25, 61, 62, 93, 95, 100, 103, 109, 140
Wiltse, Mark G. 115
Wood, H. E. 10, 17, 32, 43, 69, 83, 90, 118
Yeo, Richard R. 31
Young, D. W. 7, 10, 157, 158, 159
Zahnley, J. W. 19, 22
Zalik, Saul 84, 157
Zinter, C. C. 41, 90, 91
Zick, W. H. 10

HERBACEOUS WEEDS INDEX

Common name	Scientific name	Page
Aster, many flowered.	Aster spp.	116
Barley, wild.	Hordeum jubatum.	33, 34, 154
Barnyard grass.	Echinochloa crus-galli	38, 43, 46-48, 73, 83, 92, 103, 104, 131, 136, 141, 149
Batchelor's button.	Centaura cyanus.	45
Bedstraw, northern.	Galium boreale	37, 46, 47
Bindweed, field	Convolvulus arvensis	13, 19-22, 154
Blue bur.	Lappula echinata	45
Blue grama.	Bouteloua gracilis	13, 154
Blue grass.	Poa pratensis.	115, 142
Blue grass, annual.	Poa annua.	46, 48
Boneset, false.	Eupatorium spp.	116
Bracken	Pteridium spp.	31
Brome grass	Bromus spp.	2, 7, 9, 13, 20, 29, 46, 48, 115, 116, 154
Buckwheat Tartary	Fagophyrum tartaricum.	33, 34, 42, 43, 73, 79, 83
Buckwheat, wild	Polygonum convolvulus.	33, 37, 41, 42, 46, 47, 73, 81-83, 92, 105, 108, 111, 124
Buffalo bur	Solanum rostratum.	46
Burdock	Arctium minus.	37, 49
Carpet weed	Molluga venticillata	125, 126, 133
Carrot, wild.	Daucus carota.	37, 49
Catchfly, night-flowering	Silene noctiflora.	7, 37, 46, 47
Catnip.	Nepeta cataria	161
Chess	Bromus spp.	38, 46-48
Chickweed, common	Stellaria media.	46, 127
Cinquefoil, rough	Potentilla monspeliensis	45
Cocklebur	Xanthium spp.	37, 45, 47
Cockle, corn.	Agrostemma githago	33, 46
Cockle, cow	Saponaria vaccaria.	42, 46, 81
Cockle, white	Lychnis alba	37, 46, 48, 161
Corn spurrey.	Spergula arvensis.	37, 46, 47
Crab grass.	Digitaria spp.	44, 44, 46-48, 102, 124, 126, 127, 129-131, 133, 142, 143, 153
Cress, hoary.	Lepidium draba	27, 28
Cress, marsh.	Radicula palustris	160
Cucumber, wild bur.	Sicyos angulatus	46
Dandelion	Taraxacum officinale	10, 24
Dock, curled.	Rumex crispus.	24
Dogbane	Apocyrum androsoemifolium.	10
Dragonhead.	Dracocephalum parvilflorum	37, 45, 47
False flax.	Camelina spp.	33, 42, 45, 47, 48
Fleabane, Canada or Marestail	Erigeron canadensis.	6, 46
Fleabane, Philadelphia.	Erigeron philadelphicus.	47
Flixweed.	Descurainia sophia	46
Flower-of-an-hour	Hibiscus trionum	37, 46, 47, 49, 160
Foxtail	Setaria spp.	9, 10, 33, 81, 90, 96, 111, 126-130, 132, 136, 139, 147, 153, 154
Foxtail, giant.	Setaria faberi	33, 40, 102

Common name	Scientific name	Page
Foxtail, green	Setaria viridis	2, 13, 20, 33, 38, 40-42, 46-48, 82, 86-88, 90, 102-104, 113, 122, 140
Foxtail, yellow	Setaria lutescens	38, 42, 47, 48, 102, 122, 133, 140
Galinsoga	Galinsoga parviflora	127-129
Garlic, wild	Allium vineale	27, 31, 85
Goatsbeard	Tragopogon pratense	37, 49
Goldenrod	Solidago spp.	161
Goosefoot	Chenopodium spp.	37, 45, 47, 103, 104
Goosegrass	Eleusine indica	46, 48
Hemp	Cannabis sativa	37, 46, 47
Hemp nettle	Galeopsis tetrahit	37, 46, 47
Hemp, water	Acnida tuberculata	131, 132
Henbit or dead nettle	Lamium amplexidaule	45
Horsetail, field	Equisetum arvense	27, 32, 97, 106, 154
Ironweed	Verbena hastata	116
Jewelweed	Impatiens pallida	45
Johnson grass	Sorghum halapense	12-14, 20, 151, 154
Kochia	Kochia scoparia	13, 20, 154
Knapweed, Russian	Centaurea repens	27, 28, 151, 154
Knotweed	Polygonum aviculare and P. erectum	46
Lamb's quarters	Chenopodium album	6, 37, 39, 45-49, 79, 87, 103, 104, 108, 111, 122, 124, 127-129, 132, 136, 146, 148, 149, 160
Lettuce, wild	Latuca spp.	37, 45, 47
Mallow	Malva rotundifolia	37, 46, 47, 161
Marsh Elder	Iva xanthifolia	37, 45, 47, 161
Mayweed or dog fennel	Anthemis cotula	46
Medic, black	Medicago lupulina	37, 46, 47
Milkweed	Asclepias syrica	160
Milkweed, climbing	Gonolobus laevis	12
Morning glory	Ipomoea spp.	10, 37, 45, 47
Mullein	Verbascum thapsus	37, 49
Mustard, ball	Nesilia paniculata	45
Mustard, black	Brassica nigra	160
Mustard, hare's ear	Conringia orientalis	33, 37, 42, 45, 47
Mustard, hedge	Sisymbrium officinale	160
Mustard, Indian	Brassica juncea	37, 45, 47
Mustard, tansy	Sophia spp.	45
Mustard, tumbling	Sisymbrium altissimum	37, 45-47, 160
Mustard, wild	Brassica arvensis	43, 45, 47, 73, 75, 80, 81, 86-88, 91, 92, 96, 111, 147, 160
Mustard, worm-seed	Erysimum cheiranthoides	160
Nightshade, black	Solanum nigrum	46
Nightshade, silverleaf	Solanum eleagnifolium	13, 20
Nutsedge	Cyperus esculentus	24
Oats, wild	Avena fatua	32-35, 38-43, 46, 48, 86, 87, 96, 140, 141, 147, 152-154
Parsnip, wild	Pastinaca sativa	49
Pepper-grass	Lepidium spp.	37, 45, 47, 160
Pigweed, red root or rough	Amaranthus retroflexus	37, 40, 43, 46, 48, 79, 84, 87, 96, 102-105, 108, 111, 120, 122-132, 134, 136, 153

Common Name	Scientific name	Page
Pigweed, Russian	Axyris amaranthoides	36, 37, 46, 47, 107, 108, 113, 154
Pigweed, smooth	Acnida spp.	147-149
Pineapple weed or wild marigold	Matricaria matricarioides	45
Plantain	Plantago spp.	10, 45
Plantain, buckhorn	Plantago lancerlata	24, 161
Plantain, common	Plantago major	24
Primrose, evening	Oenothera biennis	49
Punture vine	Tribulus terrestris	13, 20, 45, 47, 154
Purslane	Portulaca oleracea	37, 45, 47-49, 79, 120, 122, 124, 125, 127-129, 154, 160
Quack grass	Agropyrum repens	1-11, 24, 57-59, 97, 106, 136, 151
Radish, wild	Raphanus raphanistrum	37, 45, 47, 160
Ragweed, common	Ambrosia artemisiifolia	9, 10, 13, 20, 37, 39, 45, 47, 111, 116, 127
Ragweed, giant or Kinghead	Ambrosia trifida	37, 39, 45, 47, 106, 160
Rocket, yellow	Barbarea vulgaris	160
Rutabaga	Brassica campestris	160
Sage pasture	Artemesia frigida	116-118
Sandburs	Cenchrus spp.	46, 48
Shepherds purse	Capsella bursa-pastoris	37, 46, 47, 132, 160
Smartweed	Polygonum spp.	9, 10, 37, 46, 47, 96, 105, 124, 127, 128, 131, 147-149, 153, 160
Smartweed, Lady's thumb	Polygonum persicaris	9, 40, 73, 83, 92, 123, 132, 160
Smartweed, Pennsylvania	Polygonum pennsylvanicum	87, 102
Speedwells	Veronica spp.	46
Spurge, flowering	Euphorbia corollata	10, 57
Spurge, leafy	Euphorbia esula	15-17, 151, 154, 160
Spurge, mat	Euphorbia glyptosperma	46
Spurge, ridge-seeded	Euphorbia spp.	32
Squirrel-tail grass	Hordeum jabatum	46, 48
Stickseed	Lappula spp.	37
Stinkweed	Thlaspi arvense	6, 37, 45, 49, 73, 79-81, 84, 87, 91, 92, 103, 105, 108, 119, 120, 122, 160
Sunflower, wild	Helianthus spp.	37, 46, 48
Sweet grass	Anthoxanthum odoratum	2
Thistle, annual sow	Sonchus oleraceous	45
Thistle, Canada	Cirsium arvensis	7, 9, 10, 23-25, 120
Thistle, perennial sow	Sonchus arvensis	2, 10, 23, 25, 26, 43, 105
Thistle, Russian	Salsola kali	13, 20, 33, 35, 36, 43, 45, 48, 73, 75-78, 80, 81, 84, 86, 89, 91, 92, 105, 108, 111, 119, 120, 122, 154
Toad flax	Linaria vulgaris	27, 29-31, 46
Tomato, wild	Solanum triflorum	79
Velvet Leaf or Indian mallow	Abutilon theophrasti	37, 46-49, 127, 129, 133, 134
Vervain, hoary	Verbena stricta	116

Common Name	Scientific name	Page
Vetch, annual	Vicia sativa	37, 45
Water weeds		50
Wheat grass, western	Agropyron smithii	13, 20, 154
Winter-cress or bitter wormwood	Barbarea vulgaris	45
Witch grass	Panicum capillare	38, 48
Yarrow	Arhillea millefolium	116

WOODY PLANTS INDEX

Common name	Scientific name	Page
Alder	Almus incana	51, 71, 72
Ash	Fraxinus spp.	56
Ash, green	Fraxinus lanceolata	69
Ash, prickly	Zanphoxylum americanum	59
Aspen	Populus spp.	51, 52, 54, 63, 71
Barberry, European	Berberis vulgaris	51, 59
Birch	Betula spp.	63, 65, 68, 71
Buckbrush	Symphoricarpos spp.	51, 64-67, 69
Buckthorn	Rhamnus carthartica	55, 71
Cherry, wild black	Prunus serotina	59
Chockecherry	Prunus virginiana	65-67, 69, 71
Cottonwood	Populus spp.	51, 58, 59, 69
Crataegus	Crataegus spp.	59
Dogwood	Cornus spp.	59, 63, 65, 68, 71
Elder, box	Acer negundo	56, 69
Elm	Ulmus spp.	56, 59
Elm, American	Ulmus americana	55, 69
Elm, red	Ulmus fulva	55, 69
Hackberry	Celtis occidentalis	56
Hawthorne	Crategus spp.	61, 63, 67, 69
Hazel	Corylus spp.	69, 71, 72
Hickory	Carya spp.	56, 59, 60, 61
Honeysuckle	Lonicera japonica	61, 71
Hoptree	Ptelea trifoliata	59
Locust, honey	Gledilsia triacanthos	56, 59
Maple, Manitoba	Acer negundo	2
Maple, red	Acer ruburm	52
Maple, silver	Acer saccharinum	56
Mesquite	Prosopis juliflora	51, 70, 71
Mulberry	Morus alba	56
Oak, black	Quercus velutina	56, 59
Oak, black jack	Quercus marilandica	53-56
Oak, bur	Quercus macrocarpa	59, 69
Oak, post	Quercus stellata	53-56, 60
Oak, red	Quercus borealis	56, 59
Oak, scrub	Quercus ellipsoidales	52, 56, 152, 154
Oak, shingle	Quercus imbricaria	59
Oak, white	Quercus alba	56, 59
Osage, orange	Maclura pomifera	59
Persimmon	Drospyros virginiana	54, 60, 61
Pine, jack	Pinus banksiana	51, 57, 58, 71, 72, 154
Pine, red	Pinus resinosa	51, 57, 58, 71, 72, 154
Pine, white	Pinus strobus	51
Poplar	Populus spp.	58, 59, 63, 64, 67-69, 154
Rose	Rosa spp.	7, 51, 63, 65-67, 69
Saskatoon berry	Ameliancher alnifolia	10, 63, 69
Sassafras	Sassafras albidum	56, 60, 61
Silver berry	Elaegnus commutata	65, 66
Snowberry	Symphoricarpos occidentalis	10, 69, 70, 116, 118
Spruce, black	Picea mariana	71
Tree of heaven	Ailanthus glandulosa	62
Walnut, black	Juglans nigra	56, 59
Willow	Salis spp.	43, 62-64, 68, 69, 71
	Condalia obtusifolia	68

CROPS INDEX

Common name	Scientific name	Page
Alfalfa	Medicago sativa	2, 10, 37, 95, 96, 107-115, 144, 146, 147, 151, 153, 156, 157
Asparagus	Asparagus officinalis	120, 152
Barley	Hordeum sativum	2, 4, 10, 13, 20, 30, 32, 34, 39, 43, 73, 79, 81, 83-85, 108, 144, 154, 157
Bean	Phaseolus vulgaris	10, 11, 101, 102, 126-131, 151-153
Bean, lima	Phaseolus lunatus	126-129, 151, 152
Beet	Beta vulgaris	2, 11, 126-129, 131, 132, 151-153
Beet, sugar	Beta vulgaris	40, 41, 139-141, 153
Broccoli	Brassica oleracea	129
Brome grass	Bromus spp.	110, 116, 117
Cabbage	Brassica oleracea	129
Carrot	Daucus carota	2, 126-131, 151-153
Cherry, sour	Prunus cerasus	135, 136, 152, 153
Clover		145, 146
Clover alsike	Trifolium hybridum	107, 110-113
Clover, ladino	Trifolium repens	107, 110, 111, 113
Clover, red	Trifolium pratense	10, 107, 110-113, 143, 144, 150
Clover, sweet	Melilotus spp.	39, 43, 107, 110-113, 144, 147
Conifer seedbeds		138
Corn, field	Zea mays	2, 5-7, 10, 12, 13, 23, 24, 25, 40, 93-97, 144, 145, 147, 148, 153, 155, 158, 161-164
Corn, sweet	Zea mays	11, 119, 120, 126-130, 151-153
Cotton	Gossypium herbaceum	44, 154
Cowpeas	Vigna sinensis	44, 154
Cucumber	Cucumis sativus	126, 128-130
Flax	Linum usitatissimum	2, 3, 5, 6, 10, 39, 41, 43, 86-91, 95, 111, 112, 147, 152, 154, 157
Gladiolus	Gladiolus spp.	135, 137
Lespedeza	Lespedeza procumbens	143
Lettuce	Lactuca sativa	2, 126-129, 151, 152, 153
Millet, German	Setaria italica	94, 100, 103, 132
Muskmelon	Cucumis melo	126, 128-130, 133, 152, 153
Nursery stock		135, 138
Oats	Avena sativa	2, 3, 5, 6, 10, 19, 22, 26, 34, 39, 43, 73-75, 77, 79, 82-84, 97, 109, 144, 145, 151, 156, 161
Onion	Allium cepa	2, 77, 95, 119-125, 127-129, 151, 152, 153
Parsnip	Pastinaca sativa	2, 129
Pea	Pisum sativum	2, 3, 100, 103-106, 129, 130, 152, 153, 161
Peanut	Arachis hypogoea	44, 154
Potato	Solanum tuberosum	2, 11, 119, 120, 122, 123, 126, 127, 129, 152, 153
Potato, sweet	Ipomoea batatas	126, 130, 133, 152, 153
Radish	Rhaphanus sativus	2, 111, 126-129, 151, 152, 158

Common name	Scientific name	Page
Rape	Brassica Napus	84, 94, 100, 157
Raspberry	Rubus strigosus	135, 152
Ryegrass	Lolium spp.	94
Sorghum	Sorghum spp.	21, 22, 98, 99
Soybeans	Glycine max	5, 10, 24, 40, 94-96, 100-106, 144, 147-149, 152-154, 157, 158, 160, 161
Spinach	Spinacia oleracea	126-129, 151-153
Squash	Cucurbita spp.	126, 130, 161
Strawberry	Fragaria spp.	135-137, 152
Timothy	Phleum partense	110, 143
Tobacco	Nicotiana spp.	152-154
Tomato	Lycospersicum esculentum	126-129, 131, 133, 151-153, 159, 160, 161
Turnip	Brassica rapa	126, 127, 129, 152, 153
Watermelon	Citrullus vulgaris	126, 130
Wheat	Triticum spp.	2, 3, 10, 15, 16, 21, 22, 28, 30, 35, 41-43, 73, 75-78, 80, 81, 84-86, 109, 112, 116, 144, 145, 154, 160, 161
Wheat grass, crested	Agropyron cristatum	2, 15, 16, 29, 30

NEW HERBICIDES INDEX

Herbicide	Page
Allyl alcohol	130
Beta naphthoxyacetic acid	151, 156
Chlordane	142, 143
4-chloro phenoxy acetic acid	2, 8, 26, 28, 107-109, 151
3-p-chlorophenyl-1-1-dimethylurea (CMU)	1-15, 17-21, 23, 24, 28, 30-38, 40-44, 57-59, 73, 78, 79, 83, 86, 87, 90-97, 100-104, 106, 107, 110, 113, 119-126, 129-131, 135-137, 139, 143, 144, 147, 151, 153, 154
Dichloral urea	12, 14, 39-41, 135, 137, 139, 140
3, 6-endoxohexahydro phthallic acid (Endothal)	2, 5, 41, 91, 100-102, 107, 110, 119-126, 131, 132, 135-137, 139-141, 144-146, 148-152
Isopropyl-N-(3-chlorophenyl) carbamate (CIPC)	33, 35, 40-42, 44, 58, 59, 81,86, 87, 90, 92-95, 100-102, 104-107, 109, 111, 113, 119, 122-125, 127, 128, 131, 133, 135-137, 139-141, 151,153
Isopropyl-N-(4-chloro phenyl) carbamate (4 chloro IPC)	156
Maleic hydrazide (MH)	2, 7, 10-14, 30, 31, 33, 38, 39, 78, 86, 87, 95, 103, 104, 151, 158,159
Monosodium cyanamid	103, 144, 145
N-1-naphthyl phthalamic acid	38, 40, 44, 100-104, 119, 124-126, 129-131 133, 135, 137, 138, 140, 151, 152
N-1-naphthyl phthalimide	125, 126, 130, 131, 133, 135, 138, 151, 152
Octachlorocyclohexenone	128, 151
Sodium 2, 4-dichloro phenoxy ethyl sulfate (SES)	40, 93, 96, 100-104, 119, 120, 123, 125, 128, 130, 131, 135-138, 151, 152, 163,164
2, 4-dichloro phenoxy ethyl benzoate (SESIN)	20, 103
Sodium heptadecyl sulfate	50
Sodium isopropyl xanthate	119, 120, 124-128, 133, 144-146, 150, 151
Sodium monochloroacetate	54, 119, 125, 147
Trichloroacrylate	2, 18, 27, 28, 151
Trichlorobenzoic acid esters	96
Xanthogen disulfide	41, 135, 137, 139

QUACK OR COUCH GRASS

Summary

A.C. Corder

Twenty abstracts were reported on relative to trials with chemicals for quack grass control. Ten references were made to investigation with TCA, 12 with CMU, 4 with sodium chlorate, and 2 with MH. Other chemicals reported on were borascu, polybor chlorate, stodard solvent, endothal, trichloroacrylate and paraphenoxyacetic acid. In general, results are as follows:

TCA

1. Late summer or fall applications more effective than spring treatment, although work in Iowa indicates best kills obtained by early spring application just as the quack commences growth.

2. Cultivation increases the effectiveness of TCA. Cultivation prior to chemical application more effective than that succeeding. Thorough cultivation best such as that given by plow or one-way disc.

3. Rates of TCA required for virtual elimination vary according to region. On undisturbed sod 80-100 pounds acid per acre are needed. In combination with effective tillage 40-70 pounds sufficient, although in South Dakota complete control was obtained with as little as 20 pounds.

4. TCA combined with other chemicals may produce a more practical herbicide for specific purposes. In Iowa 40 pounds TCA plus 80 pounds sodium chlorate per acre have been found equal to 100 of the former or 400 pounds of the latter chemical.

5. The residual effect of TCA on crops that follow varies considerably according to region. In sub-humid climes where TCA is applied fully one year ahead of seeding no residual effect may be expected with most agricultural crops; in warmer, more humid regions a six-month period would seem sufficient.

CMU

1. Early spring or late fall applications seem more effective than those made during the growing season within these periods. One abstract reports greater lethal effect from fall application than from that made in spring.

2. Cultivation does not appear to enhance the killing action of CMU.

3. Complete to almost complete kills obtained by 20-50 pounds active ingredient per acre, according to region.

4. CMU is a very slow acting chemical and its residual effects are long lasting. Crop plants were killed or severely injured when seeded on land treated a full year previous with comparatively low rates of CMU, i.e., 20 pounds per acre.

Other Chemicals

1. The effectiveness of sodium chlorate appears to vary according to region. Rates of from 3-5 pounds per square rod are required for complete control.

2. Early spring application of MH to quack grass sod, plowing, working down and seeding to a crop offers temporary control. In Ohio only slight recovery from quack occurred during season of treatment with 12 pounds MH per acre applied in this way. Similar results were obtained in Wisconsin with 16 pounds and vegetables sown on the treated area grew normally and were more vigorous than on the check plots due to lessened quack grass competition.

3. Stodard solvent applied in the spring at 200 gallons per acre completely eliminated quack. Endothal and trichloroacrylate were most effective when applied in the fall on plowed sod giving fair control at 32 and 80 pounds per acre, respectively. Paraphenoxyacetic acid was not effective at the rates used. Borascu and polybor chlorate were effective at the rates used if applied in the fall.

Abstracts of Results of Cooperators

CMU and TCA for control of quack grass. Brown, D.A. CMU contained in a water spray at 120 gallons per acre was applied to an old, dense sod of quack grass at rates of 20, 40, 60 and 80 pounds of active ingredient per acre in June, 1951. By August, 1951, all grass, including quack, brome, sweet grass and crested wheat grass, was killed 100 per cent on all plots. Alfalfa present gave evidence of tolerance at lower rates. Plots remained devoid of vegetation in the spring of 1952. Crops drilled across the plot area included wheat, oats, barley, flax, corn, potatoes, lettuce, radish, beets, carrots, onions, peas and parsnip. All these crops germinated normally and looked well in the seedling stage but all completely died soon afterward. The plot area remained free of vegetation during the remainder of the year. Drift from the spray partially killed Manitoba Maple (Acer negundo) bordering the plots. A second test was laid down in September, 1951, including CMU at the same rates as in the earlier test, and TCA at 25, 50, 75 and 100 pounds of salt per acre. These were applied to a solid stand of closely pastured quack grass. A year later quack grass was 100 per cent killed by CMU at all rates. Regrowth of quack on TCA plots was 55 per cent at the 25-pound rate, 35 per cent at the 50-pound; 25 per cent at 75-pound and 18 per cent at the 100-pound rate. During the summer plots at the 100-pound rate became occupied by a dense growth of perennial sow thistle and green foxtail. The incidence of these weeds on TCA plots was in inverse ratio to the percentage of quack grass killed. (Contributed by Experimental Farm, Brandon, Manitoba).

The effect of CMU on quack grass (Agropyron repens), 1952. Burrows, V.D. and Olson, P.J. Six 12 ft. x 12 ft. plots were laid out on a solid stand of Agropyron repens and treated with 0, 5, 10, 25, 50 and 100 lb. active ingredient per acre. Two replications were used. The treatments were applied when the Agropyron repens was 9-12 inches tall. Two weeks after application the plots treated with 50 and 100 pounds were stunted and burned, while those treated with 10 and 25 pounds were lodged and slightly burned. The 5-pound rate was only slightly less vigorous than the check. In the fall the effectiveness of the various rates were classified on the basis of reduction of stand as very poor (0, 5 lb.), poor (10 lb.), fair (25 lb.), good (50 lb.) and excellent (100 lb.). The plots will be observed in the spring of 1953 for degree of recovery. (Contribution from the Division of Plant Science, The University of Manitoba, Winnipeg).

The residual effect of TCA on crops that follow. Carder, A.C. The residual effect of TCA (sodium trichloroacetic acid) was studied in 1951 and 1952 by preparing in the spring of either year a seed-bed and planting rows of Saunders wheat, Beaver oats, Redwing flax and Chancellor peas where 50 and 100 pounds, acid equivalent, had been applied in the early autumn of 1950. In 1951 the wheat seeded where the light dosage had been used completely killed out, the oats almost so, the flax did poorly, while the peas were little affected. With the heavier rate the wheat and oats succumbed, the flax nearly so and the peas showed definite reduction of vigour. The same crop types seeded in 1952 on contiguous areas to those that had grown them the previous year indicated no injury whatever at either the 50- or 100-pound rates. (Contribution of Dominion Experimental Station, Beaverlodge, Alberta).

Response of couch grass to CMU. Carder, A.C. A continuous sward of couch, Agropyron repens, was sprayed with CMU (3-p-chlorophenyl-1-1-dimethylurea) at 20, 40, 80 and 100 pounds active ingredient per acre in the spring of 1951 when possessing 3 to 4 inches of growth. Examination three months later showed survival in all plots, the heaviest or 100-pound treatment indicating an 85% kill. Inspection in the spring of 1952, however, showed progressive death of couch with 85, 98, 100 and 100% kills for the 20-, 40-, 80- and 100-pound rates, respectively; while four months later or in the autumn of that year respective percentage kills were 90, 99, 100, 100. (Contribution of Dominion Experimental Station, Beaverlodge, Alberta).

Treatment of couchgrass with CMU alone and in combination with cultural means. Carder, A.C. A continuous infestation of couch, Agropyron repens, on a shallow-black clay loam was treated with CMU (3-p-chlorophenyl-1-1-dimethylurea) at nil, 10, 20, 40 and 80 pounds active ingredient per acre. The chemical was sprayed (1) on undisturbed sod, (2) on undisturbed sod one-wayed 5 inches deep two weeks later, (3) following one-waying 5 inches deep, and (4) following one-waying 5 inches deep but preceding a second one-waying. All treatments other than the delayed one-waying were made the same day,

when the couch possessed 20 inches of leaf growth and was showing head. Soil moisture was good at time of treatment but no substantial rainfall occurred for 2 weeks after; moderate moisture obtained from then till end of season. Inspection at this time indicated little enhancement of the killing action of CMU by cultivation. Where the chemical was applied to undisturbed sod kills were as good as where one-waying was done to treated sod two weeks later; they were much better than where the sod was one-waved immediately prior to chemical application but not as effective as where the chemical was applied between one-wayings. Marked promotion of killing was induced by increasing dosage. Where CMU was applied to undisturbed sod percentage of top growth kill was 50, 55, 70 and 82 for the 10-, 20-, 40- and 80-pound rates, respectively. Very similar relations obtained where the CMU was applied in combination with cultivation. Cultural treatment alone caused no reduction of couch. The experiment involved autumn treatments but their effectiveness will not be known until 1953. (Contribution of Dominion Experimental Station, Beaverlodge, Alberta).

Residual effect of sodium TCA and calcium TCA used for couch grass control in cultivated land. Corns, W.G. Land heavily infested with couch grass was sprayed with sodium TCA or calcium TCA following cultivation with a one-way disc on June 14, 1951 (Stage 1) or September 19, 1951 (Stage 2). Rates were 10, 20, 40, 80, 160 pounds TCA acid equivalent in 160 gallons water per acre, on duplicate 100 sq. ft. plots for each treatment. Observations for 1951 are recorded in that year's Proceedings of Weed Control Conference. Observations in May, 1952 for Stage 1 treatments indicated 25-20% of original infestation of couch grass for 10- and 20-pound treatments, 5-10% couch grass for 40-pound treatments and complete kill for higher rates. Mixed annual weeds were present in all plots but sparser where 80 and 160 pounds TCA were used. Comparable spring observations for the Stage 2 treatments showed 20-10% couch grass for 10- and 20-pound rates and virtually complete kill at higher rates. There were very few annual weeds present and no consistent differences attributable to formulation. On May 27, 1952, all plots were disced and seeded to Olli barley. All plots of Stage 1 treatments grew normally. Only the 10- and 20-pound rates of TCA permitted normal growth of barley on Stage 2 plots. For this reason all plots were again cultivated and seeded on July 25, 1952. This time, all plots except 80 and 160 pound TCA fall treatments produced normal growth and survival. It appears to be safe, therefore, to seed grain during the spring following adequate spring treatments with TCA, but unsafe following fall treatments with same amounts of chemical. Fall treatments were, however, slightly more effective than spring treatments against couch grass in this experiment. (Contribution of Department of Plant Science, University of Alberta, Edmonton, Alberta).

Residual effect of CMU, sodium chlorate, borascu and pol[illegible] chlorate on mowed and unmowed couch grass sod. Corns, W.G. On June 25, 1951 when couch grass was 30 inches tall and heading, duplicate 100 sq. ft. plots of dense mowed or unmowed sod at Edmonton were treated with various soil sterilants as follows:

CMU, 54, 108, 216 lb./acre; sodium chlorate, borascu, and polybor chlorate at 1, 3, 6, 9 pounds per 100 sq. ft. CMU was applied as a spray at 60 gal./acre. The other chemicals were applied in dry form. Abundant precipitation followed during1951 and 1952. Results during 1951 are summarized in the 1951 Conference Proceedings. Observations during 1952 showed all CMU plots absolutely bare throughout the season. Borascu again was ineffective and while polybor chlorate suppressed growth to some extent, this effect was not great. Sodium chlorate plots, all of which were bare in spring, gradually became covered with renewed growth of couch grass commencing first in the unmowed areas and at the lower rates. Clearly, CMU gave the best results in this experiment and a beneficial effect of mowing prior to application of chemical was apparent in chlorate-treated plots. (Contribution of Department of Plant Science, University of Alberta, Edmonton, Alberta).

Quack grass control with TCA and plowing. Derscheid, Lyle A. Replicated one-by-three-rod plots of quack grass were treated with sodium TCA September 25, 1951, May 10, 1952, and July 10, 1952. TCA was applied in 64 different ways: At rates of 40, 60, 80 or 100 lb./acre on sod each of the 3 dates; at rates of 20, 30, 40 or 60 lb./acre on newly plowed sod on the 3 dates; 4 plots of each rate of 10, 20, 30 or 40 lb./acre on fall plowing with spring retreatments of 10, 20, 30 or 40 lb./acre on 1 plot of each rate used in the fall; 4 plots each at 10, 20, 30 or 40 lb./acre on sod in fall with spring treatments of 10, 20, 30 or 40 lb./acre on spring plowing on each rate used in fall; fall plowing alone; fall plowing with spring applications of TCA at 20, 40 or 60 lb./acre; and no treatment. Notes made in September, 1952, indicated that 20 lb./acre gave complete elimination if used in any one of 4 methods: (1) plow and spray in September, (2) plow and spray in May, (3) fall plow and spray with 10 lb./acre in fall and retreat with 10 lb./acre in May, and (4) spray sod with 10 lb./acre in September and plow and spray with 10 lb./acre in May. Higher rates also gave complete elimination. Fall plowing followed by a spring application of 40 lb./acre or a fall application of 80 lb./acre on quack grass sod were also effective treatments.

Soybeans, corn, oats and flax were seeded on June 10, 1952, on all plots that included plowing in the treatment. Corn, oats and flax did not show any effects of TCA but the soybeans died on all plots before the end of July. (Contributed by the Agronomy Department, South Dakota Agricultural Experiment Station, State College Station, South Dakota).

Effect of new herbicides on quack grass. Derscheid, Lyle A. Duplicate square-rod plots were treated with CMU at rates of 10, 20, 40, 80 or 120 lb./acre, endothal at 2, 4, 8, 16 or 32 lb./acre, endothal activated with ammonium sulfate at 2, 4, 8, 16 or 32 lb./acre and trichloroacrylate at 5, 10, 20, 40 or 80 lb./acre. Treatments were applied to plowed sod and to undisturbed sod in late September, 1951. Identical applications of CMU, endothal and activated endothal were made in May, 1952. Stodard solvent and stodard solvent fortified with methylated naphthalene were applied at rates of 150, 200, 250

or 300 gal./acre on a cool day in May, 1952. The last notes were taken the first part of October, 1952, and up until that time CMU gave complete elimination when applied to sod or to plowing in the fall at rates of 20 lb./acre or above and when applied to plowing or to sod in the spring at rates of 40 lb./acre or above. Spring applications of both stodard solvents appeared to give complete elimination at rates of 200 gal./acre or above. The two endothals were not effective when applied in the spring, but the 32 lb./acre rate gave fair control when applied on fall plowing. The same was true of the 80 lb/acre rate of trichloroacrylate. (Contributed by the Agronomy Department, South Dakota Agricultural Experiment Station, State College Station, South Dakota).

Quack grass control with TCA and subsequent cropping. Dunham, R.S., R.G. Robinson, and A.F. Wiese. This study is a comparison of (1) September vs. April applications (2) flax vs. corn on TCA treated plots (3) tillage vs. additional TCA following flax and corn harvest. TCA at 22 lb. per acre was sprayed on sod plowed in September, 1950. Applications were made in September, 1950 and April, 1951. Flax and corn in 1951 on September-treated plots grew normally and corn yielded significantly more than that on the unsprayed plots. Flax on April-treated plots was delayed in blooming but yielded as well as the unsprayed. Corn was almost a total failure on April-treated plots. A small amount of quack grass remained on all treated plots. Following harvest in 1951, one-half of each plot was disced on two dates and the other half sprayed with 17.6 lb. of TCA. In 1952, the entire was sown to oats and yields of oats and quack plants taken. Quack was controlled better on land cropped to flax than corn. The second treatment with TCA gave better control of quack than discing. Eradication of quack was almost complete on all plots sown to flax and either treated with additional TCA or disced in 1951. Although some quack remained on the corn plots, practical control was obtained. (Contribution from the Division of Agronomy & Plant Genetics, University of Minnesota; St. Paul, Minn. Paper No. 2923 Sci. Jour. Series, Minn. Agric. Exp. Station).

Effect of CMU and TCA on couch grass (Agropyron repens). Friesen, H.A. On July 26, 1951, sodium TCA and CMU were each sprayed on plots 1 square rod in size at 20, 40, 80 and 100 pounds of active ingredient per acre. Each of the TCA treatments resulted in complete kills of the top growth in 1951. Regrowth in October of that year was 5 and 1 per cent of the original stand on those plots treated at 20 and 40 pounds of TCA per acre, respectively. On those plots treated with 80 and 100 pounds of TCA the regrowth amounted to only a few scattered plants. Each of the CMU treatments caused the couch grass to turn a sickly greenish yellow colour but by freeze-up in 1951 it did not appear to be completely dead.

In 1952, annual weeds such as stinkweed, Canada fleabane and Russian pigweed infested the TCA treated plots. Regrowth of couch on those plots treated with 20, 40, 80 and 100 pounds per acre of TCA was 80, 22, 5 and 3 per cent of the original stand, respectively. On the CMU treated plots at 20 and 40 pounds per acre rates the regrowth

of couch was 15 and 1 per cent, respectively. There was no regrowth following the 80 and 100 pound dosages in 1952. The only vegetation on any of the CMU treated plots other than the regrowth of couch mentioned above, were a few scattered plants of prairie rose. These attained a height of 3 inches but by mid-August of 1952 these too had withered. (Contributed by the Dominion Experimental Station, Scott, Saskatchewan).

Effect of maleic hydrazide on Canada thistle, quack grass, and night-flowering catchfly. Hill, Gideon, D., Burt, Evert O., and Willard, C.J. Since MH produces a temporary cessation of growth in many plants, it seemed that perhaps if plants were treated and then plowed under while still "anaethsetized" by it, that a high degree of control might be achieved. Four plots, 25' x 110', of quack grass were treated on March 27, 1952, with 0, 4, 8, and 12 lb./acre of MH in 10 gal. of water. The entire area was plowed March 31, and later planted to corn, thus adding additional cultivation to the plowing. Control of quack was estimated at 40, 70, and 90 per cent for 4, 8, and 12 lb./acre, respectively.

In an area containing Canada thistle, (10"-12" high) quack grass (6"-8" high) and night-flowering catchfly, (rapidly growing) quadrupli cated plots (7' x 50') were treated at the rate of 5, 7½, 10 and 20 lb./acre, active ingredient, on May 7, 1952. One-half of each plot was plowed on May 15, 1952.

Plowed area - the thistle plants recovered slowly at 10 and 20 lb./ acre, but bloomed at all rates. Quackgrass recovered rapidly at 5 and 7½ lb., but showed only 60 per cent recovery at 10 pounds and very slight recovery at 20 pounds by October 1, 1952. Unplowed area - thistle growth was retarded. The terminal bud was killed at all rates. Recovery from axillary buds was rapid at 5 and 7½ lb. but very slow at 10 and 20 lb. Quack grass did not increase in height after treatment at 10 and 20 lb. No quack grass seed produced at any rate. Quack grass had recovered by growth from the crowns at 5 and 7½ lb. by July 20 but had not fully recovered at the 10 and 20 lb. rates by October 1. Catchfly was killed at 20 lb./acre, but at the lower rates only the terminal bud was killed and the axillary buds produced seed. (Contributed by Ohio Agricultural Experiment Station).

Weed control on railroad ballast areas. Loomis, W.E., and D.W. Young. In a 2 year study applications of 40 pounds of TCA sodium salt and 80 pounds of sodium chlorate per acre have given effective control of quack grass, smooth brome grass, and other miscellaneous weeds. Results with this mixture have been as good as with 400 pounds of sodium chlorate alone or 100 pounds TCA sodium salt alone. Early applications just as the perennial grasses appear in the spring have given better results than late spring or summer applications. After the perennials are removed periodic retreatments with 60 gallons per acre of oil containing 50 per cent aromatic and olefin content and a boiling point over 500°F. have controlled reinfestation with annual broadleafed and grassy weeds.

Fortifying the oil with 2 pounds of 2,4-D per acre, where there is no danger of drift to susceptible crops, increases the value of the oil spray. In Iowa an April or May treatment with TCA-chlorate combined with an August application of oil has been the most economical first year treatment of several hundred tried. (Contributed by Iowa State College Experiment Station).

Response of quack grass (Agropyron repens) to TCA, 1950-1952. Pavlychenko, T.K. A series of quack grass plots, 8 x 12 ft. in size, were established in 1950 on an infestation sodded solid for many years. The plots undisturbed by cultivation were treated at the heading stage with 25, 50, 75, 100, 125 and 150 lb./acre acid equivalent of TCA in the form of ACP grass killer (TCA 90%) as top spray. The soil was a silty clay loam, moisture reasonably good and temperature 75°F. RESULTS: The results for 1950 and 1951 were reported in the 1951 NCWCC Research Report. The fall records of 1950 showed that 50 lb./acre rates were considered agronomically ineffective. Numerous plants at these rates survived and were recovering to re-infest the plots. The re-infestation increased in 1951, and in 1952 the quack grass was almost solid again. The 75 to 150 lb./acre treatments still remain free of quack grass in spite of great abundance of quack grass seed on the ground. This obviously is due to the heavy stand of annual weeds that invaded the treated plots and effectively competing not only with seedlings, but also preventing re-invasion of quack grass from the untreated areas. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Saskatchewan).

Effect of TCA, CMU and ester of Para on quack grass (Agropyron repens), 1952. Pavlychenko, T.K. and Bestrop, A.J. Plots 12 x 12 ft. in size in a solid sod of quack grass growing on silty clay loam were top sprayed at the heading stage with TCA (sodium trichloroacetate) in a form of ACP grass killer (TCA 90%) at rates of 25, 50, 75, 100 and 125 lb./acre acid equivalent; CMU (3-p-chlorophenyl-1-1-dimethyl-urea) at 20 and 40 lb./acre and with ester of Paraphenoxyacetic acid in a form of ACP 903 at 10 and 20 lb./acre rates. Before treatment the plots were divided into two ranges. The first range was undisturbed by cultivation and the second was thoroughly cultivated to a depth of 6 inches. Treatments were then applied across the two ranges. RESULTS: TCA, in the undisturbed range, gave a top kill of 100 pct. at all rates excepting 25 lb./acre where the survival amounted to 5 pct. On the cultivated range the top kill was 100 pct. at all rates. Toward the fall the regrowth amounted to 5, 2, 1, 0 and 0 pct. at the 25, 50, 75, 100 and 125 lb./acre rates, respectively. CMU, on the undisturbed range, gave top kills of 30 and 75 pct., and regrowths of 20 and 25 pct., at the 20 and 40 lb./acre rates, respectively. Corresponding figures for CMU on the cultivated range were 100 and 100 pct. top kill, and 50 and 35 pct. regrowth. ACP 903, on the undisturbed range, gave poor top kills of 15 and 20 pct., at the 10 and 20 lb./acre rates. On the cultivated range, top kills were 100 and 100 pct., and in the fall the regrowth was 15 and 10 pct. In all plots, the regrowth was from the surviving rhizomes. Final notes on regrowth will be taken in 1953.

Treatment	Rate lb./A.	Undisturbed Sod		Cultivated Sod	
		% Topkill	% Regrowth	% Topkill	% Regrowth
TCA	25	95	5	100	5
TCA	50	100	5	100	2
TCA	75	100	5	100	1
TCA	100	100	5	100	0
TCA	125	100	1	100	0
CMU	20	30	20	100	50
CMU	40	75	25	100	35
ACP 903	10	15	0	100	15
ACP 903	20	20	0	100	10

(Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Saskatchewan).

Use of soil sterilants to eradicate growth around transmission line poles, substations and pole storage yards. Playfair, L.G. Since 1950 trials have been under way to determine the most suitable chemical or compounds for this purpose. In 1950 and 1951 fall treatment with Atlacide, 2 lbs. per 100 sq. ft. in one Imperial gallon of water and the same treatment during May to October, 1952. Concentrated Borascu at 8 lbs. per 100 sq. ft. applied dry and Polybor Chlorate "88" at 5 lbs. per 100 sq. ft. applied dry and as spray in water were applied in late fall of 1951. Concentrated Borascu at 6 lbs. per 100 sq. ft. applied dry in late spring of 1952. CMU applied at 20, 40, 60, pounds per acre, as spray, in early May of 1952. Growth in areas treated was native grasses, quack or brome grass. Results: Atlacide completely eliminated all growth present and has prevented regrowth. Fall applications of Concentrated Borascu and Polybor Chlorate "88" comparable with Atlacide but late spring application of Concentrated Borascu gave very indifferent results. CMU at 40 lbs. and up per acre eradicated all growth and at 20 lb. rate gave a high degree of control. (Contribution of Manitoba Power Commission, Winnipeg, Manitoba).

CMU for quack grass control. Robinson, R.G., A.F. Wiese, O.E. Rud, and R.S. Dunham. Weeds other than quack grass present on the plots were Convolvulus sepium, Setaria spp., Cirsium arvense, Ambrosia artemisifolia, Polygonum persicaria, Apocynum cannabinum, and Euphorbia corollata. Applications of CMU in April or October were much superior to June applications; those in April and October were about equal. Applications on undisturbed sod were much superior to those on plowed sod. Unplowed plots sprayed with 80 lb. per acre in April, 1951, remained bare throughout 1952; 40 lb. remained bare except for a few dicotyledonous weeds; 20 lb. were overgrown with ragweed and smartweed. Applications to undisturbed sod at 15-20 or more lb. per acre in October, 1951, or in April, 1952, remained

practically bare throughout 1952. CMU disced in after plowing was less effective than CMU on undisced plowing; rates used were 5, 10, 15 and 20 lb. in April. Morning glory, Canada thistle, perennial sow thistle, dogbane, flowering spurge, dandelion and plantain were considerably more tolerant than foxtails and quackgrass; ragweed and smartweed were somewhat more tolerant.

Crops in 1952 on plots sprayed in October, 1951 at 5, 10 and 20 lb. per acre were injured or killed at all rates. Corn and flax were most tolerant, soybeans next, and small grains most susceptible. Small grains in order of tolerance were barley, oats, and wheat but differences were small. Red clover and alfalfa were killed at all rates. Quack grass was killed by 20 lb. and partially controlled by 10 lb. In established alfalfa, amounts of CMU sufficient to kill quack grass injured the crop seriously. Band applications between alfalfa rows for seed production did not control quack grass. (Contribution from the Division of Agronomy & Plant Genetics, University of Minnesota; St. Paul, Minn. Paper No. 2927 Sci. Jour. Series, Minn. Agric. Exp. Station).

Use of CMU for couch or quack grass control. Wood, H.E. and Watson, W.D. In Winnipeg on heavy clay loam solidly infested with quack grass, Agropyron repens, series of sq. rod plots were knapsack sprayed in 1951 and 1952 with CMU at various rates applying one imperial gallon water per plot. Rates per acre: spring, 1951 - 20, 40, 60, 80 lb. acid; early fall, 1951 - 20, 30, 40, 60 lb; spring, 1952 - 25 and 50 lb; early fall, 1952 - 10, 20, 30 lb. Complete eradication of quack was obtained from 30 lb. upward, even 20 lb. showing much promise, which prompted the lower 1952 fall application and from which data are not yet available. Deeper-rooted weeds and shrubs (dandelion, perennial sow and Canada thistle, snowberry and saskatoon) growing on the 20 lb. treated plot showed a high degree of tolerance to CMU and 17 months after treatment seemed little affected. A high degree of sterility, as indicated by planting beans, was evident on all plots over the entire period. (Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Manitoba).

Control of quack grass. Young, D.W., and W.E. Loomis. Effective control of quack grass on railroad areas has been obtained with the application of 40 pounds of TCA sodium salt and 80 pounds sodium chlorate, or 10 pounds of CMU and 80 pounds of sodium chlorate, or 20 pounds of CMU per acre. Successful treatments were obtained from November to June. Most effective treatments were made in the early spring just as the quack grass appeared. In Iowa TCA - sodium chlorate treatments have not been as effective after June 1st, as those made before this date. (Contributed by Iowa State College).

Growth of quack grass and vegetable crops following maleic hydrazide application and plowing. Zick, W.H. and Buchholtz, K.P. Plots of uniformly dense quack grass sod, 15 by 18 ft., were treated on April 30, 1952 with 0, 4, 8 and 16 lbs. per acre of maleic

hydrazide as the sodium salt applied in water at 40 gals. per acre. Soil on the area was of the Miami silt loam type. Four replications were used in a randomized complete block design. On May 13 the entir area was plowed, and on May 14, 800 lb. per acre of 3-12-12 fertiliz was applied uniformly to the area after which the area was harrowed and fitted for planting. On May 19 the area was planted to sweet corn, red beets, green beans and potatoes. Quack grass shoot counts were obtained on June 11, July 11 and July 28. The results are summarized in table form below. Highly significant reductions in shoot counts from all MH applications were obtained except for the 4 lb. rate on July 28. The June 11 counts showed the greatest reduction affected by the first 4 lbs increment. The plots were scraped with a sharp hoe after the first two shoot count observations to remove annual weeds and quack grass top growth. Heavy rains interfered with the first scraping so that accurate counts could only be made on the first two replications in the July 11 observation. There is a relative increase in shoot counts for all MH rates from the June 11 to the July 28 observation, which is especially pronounce in the 4 lb. plots. This indicates a gradual reduction in the growth inhibiting effect of the MH treatments over a period of time. All vegetables planted appeared to grow normally with all the treated plots being visibly more vigorous than the check plots due to reduction of quack grass competition.

MH appl. lb./acre	Shoots per sq. ft.			
	June 11	July 11	July 28	Total
0	37	37	26	100
4	17	25	26	68
8	8	13	14	35
16	3	5	8	16

(Contribution of Department of Agronomy, University of Wisconsin, Madison, Wisconsin).

JOHNSONGRASS

Summary. Oliver C. Lee

Chemicals, here reported, used experimentally for the control of Johnson grass include: CMU, TCA, 2,4-D, 2,4-D and 2,4,5-T, dichloral urea, sodium chlorate, polyborchlorate and maleic hydrazide. Of these, CMU, TCA and sodium chlorate are most promising. The dosage required and best time of application for satisfactory results varies with conditions as moisture, soil type and previous cultural practices. TCA is apparently most effective when applied following cultivation of the soil. Maleic hydrazide causes dwarfing and abnormal growth. 2,4-D, as a pre-emergence treatment, will check seedling growth in corn. Timely clipping of tops reduces total carbohydrate content of rhizome tissue. The application of herbicides following clipping did not affect carbohydrate composition.

Abstracts of Results of Individual Cooperators.

Sodium TCA, sodium chlorate, and polybor-chlorate on Johnsongrass, and 2,4-D on Johnsongrass seedlings. Burt, E.O and Willard, C. J. Johnsongrass plots 21' x 28', one-half of each plowed before treatment and the other half not plowed, were treated with various herbicides on October 23, 1951. The entire area was plowed and planted to corn May 14, 1952. Sodium chlorate was applied dry at 50, 100, and 150 lb/A of the commercial salt. The 150 lb. rate gave a high degree of control in the spring of 1952; the 100 lb. rate gave approximately 70 percent control; 50 lb. was ineffective. Sodium TCA at 20, 40 and 60 lb/A applied in 40 gal/A of solution gave good control at the 60 lb. rate but poor control at the lower rates. Plowing prior to the application of the herbicides increased control to a great extent. Polybor-chlorate at rates of 100, 200, and 400 lb/A damaged corn severely and gave poor weed control at all rates. Two similar experiments in which sodium TCA and sodium chlorate were used on September 14 and November 20, 1951 indicated that the early treatments were more effective. Applications of 2 and 4 lb/A, acid equivalent of 2,4-D pre-emergence to corn reduced seedling infestation by 63 and 92 percent, respectively, for a period of six weeks. Sodium TCA and sodium chlorate were applied March 18, 1952 to Johnsongrass plots 14' x 42' replicated three times, river bottom soil. Corn was planted on two dates: May 15, 58 days after treatment, and June 3, 77 days after treatment. Sodium TCA at 10, 20 and 40 lb/A, of active ingredient, gave 54, 83 and 98 percent control, respectively. Sodium chlorate at 100 lb/A gave 55 percent control. Corn planted 77 days after treatment was not damaged. The 40 lb. rate of sodium TCA and the 100 lb. rate of sodium chlorate damaged corn planted 58 days after treatment to the extent of reducing the stand by 19 and 23 percent, respectively. Damage was greater on the lighter colored soils. There was no seedling development of Johnsongrass until June 25, but by late summer all plots were completely revegetated by seedlings. (Ohio Agricultural Experiment Station.)

CMU on Johnsongrass. Burt, E. O. and Willard, C. J. CMU (80% technical material) was applied to Johnsongrass at 20, 40, 60 and 80 lb/A in 40 gal/A water on March 29, 1952, when Johnsongrass was dormant. Plots were 7' x 25', replicated three times. All rates gave complete kill of all vegetation except Johnsongrass. A few climbing milkweed (Gonolobus laevis) plants appeared about the middle of August in some plots of all treatments. Johnsongrass in plots treated at the rate of 20 lb. appeared to recover from the toxic effects of CMU about 8 weeks after treatment. Plants were more vigorous, 6 to 8 inches higher, and the leaves

were of a darker green color than the untreated plants. This may be due to less competition from other weeds. The 40, 60 and 80 lb. rates gave, respectively, 27, 92 and 100 percent apparent kill of Johnsongrass. Seedlings did not develop in any of the treated plots. (Ohio Agricultural Experiment Station.)

Maleic hydrazide for Johnsongrass control. Burt, E. O. and Willard, C. J. Johnsongrass plots were treated May 14, 1952 with 0, 4, 8, 12 and 24 lb/A of active maleic hydrazide in 40 gal/A of water. Plots were 7' by 25', replicated three times. Growth in height of all weeds was almost stopped soon after treatment; internodes were much shortened and plants branced profusely forming a whorl near the tops. Johnsongrass appeared to recover about two months after treatment at the 4 and 8 lb. rates and about three months after treatment at the 12 and 24 lb. rates. Johnsongrass treated at the two higher rates formed abnormal inflorescences about 6 weeks later than those in the untreated plots. Growth of rhizomes was similarly retarded. Other weeds were affected to a greater degree as very few resumed growth during the season at the three highest rates. Plots were treated at rates of 4, 8 and 12 lb/A of active maleic hydrazide on May 31, 1952 when Johnsongrass was 12 to 14 inches in height. Land was plowed, harrowed, and planted to corn four days after treatment. Plots were 4-corn rows wide, 42 feet long, and replicated three times. Compared to the check, 4, 8, and 12 lb/A gave 43, 77 and 83 percent control, respectively. Corn was not damaged by any of the treatments. Maleic hydrazide did not control Johnsongrass seedlings. An adjacent experiment similar to this, except that the maleic hydrazide was applied 21 days before plowing, gave very poor results. (Ohio Agricultural Experiment Station.)

Soil sterilant applications as fence row treatments. Cassaway, James E., Rea, Homer E., and Whitfield, Charles J. Applications of soil sterilants made in April 1952 were evaluated in October 1952. Results with 16 lb. of commercial concentrated Borascu per sq. rod, show western wheatgrass, little barley, annual bromes and punture vine to be susceptible. Johnsongrass, field bindweed and kochia were semi-tolerant. 5 lb of commercial sodium chlorate eradicated western wheatgrass, perennial ragweed, Johnsongrass and punture vine; while field bindweed, blue grama, kochia, silverleaf nightshade and green foxtail were semitolerant. 80 lb/A of active ingredients of CMU eradicated western wheatgrass, kochia, field bindweed, Johnsongrass, little barley, annual bromes and punture vine. No weeds survived this treatment. 40 lb/A of active ingredients of CMU eradicated kochia, little barley, annual bromes, punture vine and western wheatgrass; but Johnsongrass, field bindweed, blue grama and Russian thistle survived this rate. 40 lb of commercial calcium borate per sq rod eradicated kochia, Johnsongrass and western wheatgrass; but failed to eradicate silverleaf nightshade and field bindweed. 25 lb. of commercial calcium borate eradicated stands of kochia, annual bromes, little barley and western wheatgrass; but failed to reduce stands of field bindweed and Johnsongrass. These evaluations are of a preliminary nature and later data will be more conclusive. Rainfall from April 1, through October 15, approximates 8 in. (Dept. of Agronomy, Texas A and M, College Station, Texas.)

CMU for Johnsongrass control. Lee, Oliver C. Rates of CMU of 20, 40, 60, 80, 100 lb/A were applied on replicated plots to Johnsongrass (Sorghum halepense) on June 19, 1952. 160 gal/A of water was used. Grass was mowed to a height of 6 in before chemicals were applied. Soil is a sandy loam. All rates destroyed top growth and prevented new growth throughout the remainder of the season.

Excavations made on Oct. 20 indicate that all rates of CMU used have destroyed the rootstocks. Rootstocks were found to a depth of 14 in. in check plots. (Dept. of Botany and Plant Pathology, Purdue University, Lafayette, Indiana.)

Chemical control of Johnson grass (Sorghum halepense) in Indiana. Oyer, Edwin B., Gries, George A., Lee, Oliver C. Experiments on the field control of Johnsongrass were started on June 21, 1950 and continued through 1952. The effectiveness of the various treatments was determined by evaluating the regrowth of the grass one year following treatments. This method of evaluation gives an indication of the extent to which the rhizomes were killed by the treatments, assuming that regrowth of established plants the year following treatment is proportional to the number of rhizomes which survived the treatment. The results indicated that repeated clippings at biweekly intervals were as effective in controlling the weed as were cultivations at similar time intervals. The clipping treatment was also as effective in preventing regrowth from old plants as a single application of TCA (a 90% sodium salt) at 160 lb/A to the freshly clipped stubble. TCA at 40, 60, 80 and 100 lb/A were increasingly effective in the order of concentration, but 160 lb/A had little advantage over the 100 lb. rate. It was found, however, that two applications of 60 lb/A of TCA were also more effective in preventing regrowth than was a single application of sodium chlorate at either 480 or 800 lb/A. Applications of 2,4-D (Isopropyl ester) and 2,4,5-T (Polypropylene glycol butyl ether ester) at rates of 10, 15 and 20 lb/A inhibited the growth of the weed only for a short time after treatment. In comparing the effectiveness of applications of TCA to the foliage and to the stubble (clipped immediately before treatment) the results indicated the latter to be more effective. Clipping the grass several times at biweekly intervals before application of the chemical was advantageous if the chemical was applied before the plants would normally mature. Five herbicides were applied to dormant Johnsongrass on Nov. 5, 1950. The grass on the area had been clipped on June 21 and Sept. 13 and had regrown to about 8 in before entering dormancy. Three of the herbicides were quite effective, dichloral urea, TCA and sodium chlorate. Dichloral urea applied at 50, 75 and 100 lb/A was as effective in inhibiting regrowth from old plants as were comparable rates of TCA which were applied after the foliage was clipped in June. All rates of sodium chlorate (80, 120 and 160 lb/A) were nearly as effective in controlling the regrowth from old plants as were the summer applications at 480 and 800 lb/A, and the Nov. applications of TCA at 20, 40, 60 and 80 lb/A were all as effective as the 80 or 100 lb. rates applied after the grass was clipped in June. The applications of "Brushkiller" (a 50-50 mixture of the polypropylene glycol butyl ether esters of 2,4-D and 2,4,5-T) at 12 and 24 lb/A and maleic hydrazide at 10 and 20 lb/A were less effective in preventing the regrowth of the grass. The growth of seedlings during the following spring was not inhibited greatly by these winter applications which indicates that the soil did not remain toxic for a long period of time due to the application of these chemicals. The apparent lack of residual toxicity of these materials may be a misleading observation in view of the flooding which occurred during the winter months. The effect of continuous clipping and treatments of TCA at 80 lb/A and 2,4-D at 15 lb/A on the carbohydrate content of the rhizome tissue was studied. The initial clipping of the tops reduced the total carbohydrate content of the rhizome tissue greatly, but additional clippings or the application of either of the chemicals had little effect on the carbohydrate composition of the viable rhizome tissue collected. (Dept. of Botany and Plant Pathology, Purdue University, Lafayette, Indiana.)

LEAFY SPURGE

Summary

Lyle A. Derscheid

Eight abstracts concerning the use of chemicals for the control of leafy spurge were submitted. Six abstracts dealt with the phenoxyacetic acid compounds, one with soil sterilants and the other with soil sterilants and soil sterilants mixed with 2,4-D.

Pavlychenko found that a low volatile ester of 2,4-D was translocated to roots better than the micronized acid of 2,4-D, an alkyl ester or a mixture of 2,4-D and 2,4,5-T, but the micronized acid gave the best control followed by the low volatile ester when the leafy spurge was growing in a stand of crested wheatgrass. Mowing the wheatgrass decreased the effectiveness of the chemicals, however. He also found that treatments applied in July to a late flowering stage of growth gave better control than when applied in June to an early flowering stage. His results also indicate that the higher rates of a given chemical are more effective up to his highest rate of 6 lbs. per acre. Waywill, however, found that a butyl ester was as effective as a low volatile ester. He also observed that higher rates of application were more effective and that June treatments were more effective than September treatments. However, he states that two treatments (June and September) are more effective than a single application. In no case was 100% elimination effected with the phenoxyacetic acid compounds. He suggests that 2,4-D applications of 2 or 4 lbs. per acre when the leafy spurge is flowering followed by a ½ lb./A application in the wheat crop the subsequent year followed by a 10 oz./A treatment after one summer fallow operation the third year has reduced the stand by 75% without disrupting a regular cropping procedure.

Derscheid found that summer or early fall applications of 800 - 900 lbs. of boron trioxide or sodium chlorate alone or in mixtures gave complete elimination of leafy spurge. Wood was unable to get complete elimination with slightly higher rates and Wood indicated that a boron compound alone was less effective than a chlorate compound or mixture. Derscheid favors the boron compounds on leafy spurge. The boron compounds will eliminate this weed without permanently injuring perennial grasses. Wood and Derscheid used CMU at two locations and each obtained satisfactory results at one location with an application of 80 lbs. per acre. Wood obtained "considerable (not complete) control", while Derscheid obtained complete elimination. Derscheid used ammonium sulfamate at the rate of 640 lbs/A at one location and obtained complete elimination.

Abstracts of Results of Cooperators

Effect of Systemic Herbicides on Leafy Spurge, 1952. Pavlychenko, T. K. and Bestrop, A. J. Plots of leafy spurge (Euphorbia esula) 16 x 24 feet were seeded to crested wheat grass in the fall of 1951. In June, 1952, one half of each plot was mowed and the other left undisturbed. On July 9th, all plots were treated with 2 and 4 lb/A rates of micronized acid of 2,4-D (ACP472), butoxy ethanol esters of 2,4-D (Weedone LV4 and Weedone LV4 "Dilute"), ethyl esters of 2,4-D (Weedone Concentrate and Weedone Concentrate "Dilute"), pentasyl ester of 2,4-D (ACP649), esters of 2,4-D, 2,4,5-T and para (ACP912) and acids of 2,4-D and 2,4,5-T (ACP926). RESULTS: In both the mowed and unmowed plots the top growth of spurge was 100 pct. killed to ground level by the treatments. The roots were weak from all chemicals and rates. The translocation to roots as indicated by decay and mortality of buds was best in Weedone LV4 (4in) and progressively less with other chemicals. Regrowth was present in all plots. The new shoots came either from roots that did not have top shoots at the time of treatment or those located beyond the depth of transloca-

tion. Thus entire regrowth came up from the subterranean roots that have escaped both the direct and indirect contact with the chemicals. Regrowth was weaker, more delayed, less vigorous and numerous in the unmowed plots. Of the 16 treatments 13 showed reduction of the original population and 12 produced lower percentages in regrowth than the mowed plots. The highest reduction of the original stand was produced by ACP472 followed by Weedone LV4, Weedone LV4 "Dilute", ACP649 and 926. With the exception of the first 3 chemicals just mentioned treatments with the remaining materials were agronomically unsatisfactory. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

Effect of Systemic Herbicides on Leafy Spurge, 1951-1952. Pavlychenko, T. K. In 1951, one series of replicated 16 x 24 ft plots of leafy spurge (Euphorbia esula) grown in crested wheat grass field, was treated on June 30th, early flowering stage, with ethyl esters of 2,4-D (Weedone Concentrate and Weedone Concentrate "Dilute"); pentasyl ester of 2,4-D (ACP649), butoxy ethanol esters of 2,4-D (Weedone LV4 and Weedone LV4 "Dilute"), mixture of butoxy ethanol esters of 2,4-D and 2,4,5-T (Weedone Brush Killer 32) and amine salt of MCP (Weedar MCP). A similar series was treated on July 26th, late flowering stage, with the same chemical, but at 3 and 6 lb/A rates. Preliminary results were reported in the 1951 NCWCC Research Report. The final records were taken in 1952.
RESULTS: Excepting the MCP plots the early series showed more regrowth than did the late series. The MCP treatments were ineffective at both rates and dates. In the June series regrowth was plentiful and healthy with the exception of Weedone Concentrate "Dilute" at both rates. In the July series, the regrowth was less prevalent and vigorous and was suppressed most in the plots of Weedone LV4 6 lb/A, Weedone LV4 "Dilute" 3 lb/A, Weedone Concentrate 3 lb/A, Weedone Concentrate "Dilute" and ACP649 at both rates. The other treatments had regrowth percentages equal to, or surpassing, the original population. (Contributed by Agr. Div., American Chemical Paint Company, Saskatoon, Sask.)

Summary of repeated treatments of Leafy Spurge from 1950 to 1952. Pavlychenko, T. K. A very heavy (100 or more plants sq yd.) infestation of leafy spurge (Euphorbia esula) growing on cultivated light sandy loam soil was repeatedly treated in 1950, 1951 and 1952 with esters of 2,4-D, or mixtures of 2,4-D and 2,4,5-T esters. In 1950, a series of replicated plots in the early flowering stage was treated at 2 and 4 lb/A rates of various esters of 2,4-D and mixtures of 2,4-D and 2,4,5-T. Other equally dense infestations were also treated one month later when the weed was more advanced. The fall records of 1950 showed heavy regrowth in the plots treated in June and only occasional shoots in the late treatments. In 1951, the entire field was sown to wheat and treated with 8 oz/A of ethyl ester of 2,4-D. This effectively controlled the top growth and a yield of wheat on this light and poor soil was 20 bu/A. In the spring of 1952 (a summerfallow year), regrowth in June treatments was quite prevalent. The owner of the land stated to us: "I believe that about one quarter of what the weed was before 1950 is still there." This year, after one cultivation, the field was treated for the third time in the late flower stage with a mixture of acids of 2,4-D and 2,4,5-T (ACP926) at the rate of 10 oz/A. In the fall the regrowth ranged from 0 to 10 pct. of the infestation of 1952. Without further chemical treatments the final records will be taken in 1953. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

Control of leafy spurge with 2,4-D. Waywell, C. G. A series of plots which are part of a test laid out by the late W. H. Gammon in 1947 have been treated once each year since 1948 with 2000 ppm 2,4-D butyl ester. While control has been good, some regrowth has appeared each year on all plots. (Contributed by Dept. of Botany, Ontario Agricultural College, Guelph, Ontario, Canada).

Chemical control of leafy spurge. Waywell, C. G. In 1950 an almost solid stand of leafy spurge was used for a series involving 66 plots. Treatments included 2,4-D butyl ester, 2,4-D/2,4,5-T esters, 2,4-D amine, 2,4-D low volatile esters, and 2,4-D isopropyl ester. Treatments were applied in June, June and September, and in September at rates of 1000 and 2000 ppm. Counts made in May 1951 indicate that single June treatments are more successful than September treatments. Two treatments were more successful than either single treatment. At 1000 ppm 2,4-D butyl ester double treatments averaged 17% of the check, 2,4-D/2,4,5-T and 2,4-D low volatile esters averaged 21% of the checks. 2,4-D amine double treatments averaged 83%. At 2000 ppm 2,4-D butyl ester and 2,4-D/2,4,5-T ester double treatments averaged 7% of the checks. (Contributed by Dept. of Botany, Ontario Agricultural College, Guelph, Ontario, Canada).

Chemical control of leafy spurge. Waywell, C. G. In 1951 a series of plots similar to those treated in 1950 were treated using a low volume spray. From 8 to 48 oz./A. of 2,4-D/2,4,5-T ester, 8 to 32 oz./A. of 2,4-D butyl ester, 16 and 32 oz./A. 2,4-D amine, 16 and 32 oz./A. 2,4-D low volatile ester, and 16 oz./A. 2,4-D sodium salt were applied. Counts made in June 1952 indicate that double treatments (June and September) were again more successful than single treatments. Single treatments in June were again more successful than September treatments. The best results, 38% of the check, were obtained from two treatments using 2,4-D/2,4,5-T esters at 32 oz./A. 2,4-D butyl ester at the same rate averaged 57% of the check. (Contributed by Dept. of Botany, Ontario Agricultural College, Guelph, Ontario, Canada.)

Use of various chemicals in the control of leafy spurge. Wood, H. E. and Craig, H. A. Since 1950, when trials with 2,4-D as a means of eradicating leafy spurge, Euphorbia Esula, were discontinued due to unsatisfactory results, a variety of compounds have been applied as spray to infested square-rod plots, at several locations, at different seasons and at differing rates (per acre) as follows: 1950 - Polybor-chlorate 88 and concentrated Borascu (applied dry) respectively, 960 and 1,440 lbs., Atlacide 640 and 1, 280 lbs; June 1951- Polybor-chlorate 88 and concentrated Borascu as before; Chlorax 114, 132 and 160 imperial gals; Atlacide 24 lbs. plus 1 lb. 2,4-D and 24 lbs. and 2½ lbs., CMU 10, 20, 40 and 80 lbs. acid; July 1951 - Polybor-chlorate 88 concentrated Borascu as before; Oct. 1951 - Atlacide 870 and 1,740 lbs. Polybor-chlorate 88, 1,740 lbs. Concentrated Borascu 1,740 lbs.; July 1952 - CMU 25, 50 and 75 lbs., Atlacide 870 lbs., Polybor chlorate 640 and 960 lbs., Chlorax (powder) 435, 870, 1,740 and 2,610 lbs. Results: Atlacide and Polybor-chlorate at equal rates gave comparable control, the higher rates giving rather better results, which approached 100% eradication of spurge; Atlacide eliminated the grass, Polybor chlorate 88 did not. Borascu acted similar to the Polybor-chlorates but was less effective (except at one location). CMU, even as low as 20 lbs., eradicated the grasses but only at the higher rate (80 lbs.) was there considerable (not complete) control of spurge. Chlorax gave little or no control except the 1952 application which three months later had killed all top growth. The addition of 2,4-D to Atlacide at the above rates proved ineffective. (Contribution, Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada).

Leafy spurge control with soil sterilants. Derscheid, Lyle A. Duplicate 9' x 15' plots were treated at Custer, South Dakota, September 12, 1951, and at Gary, South Dakota, on June 29, 1951, and in September, 1950. Sodium chlorate was applied at the rate of 5 lb./sq. rd. on the 1951 plots, borascu at 15 or 20 lb./sq rd on all 3 dates, concentrated borascu at 5, 10 or 15 lb./sq. rd. on all 3 dates, polybor and polybor-chlorate-88 at 8, 12 or 16 lb./sq. rd. at Gary and 5, 10 or 15 lb./sq. rd. at Custer, ammonium sulfamate at 2 or 4 lb./sq. rd. at Gary in 1951,

CMU at 10, 20, 40 or 80 lb./A. in 1951, trichloracrylate at 10, 20 or 40 lb./A. in 1951. The minimum rates that gave complete elimination are given in the following table.

Chemical	Gary		Custer	
	June 1951	Sept. 1950	Sept. 1951	
Borascu	15 lb./sq. rd.	15 lb./sq. rd.	15 lb./sq. rd.	
Conc. borascu	10 "	5 "	10 "	
Polybor	8 "	8 "	10 "	
Polybor chlorate	8 "	8 "	15 "	*
Sodium chlorate	5 "	---	5 "	
Sulfamate	4 "	---	---	
CMU	none	---	80 lb./A.	
Trichloroacrylate	none	---	none	

* 10 lb./sq. rd. gave 90% elimination.

These data indicate that summer or early fall applications of 300 - 900 lbs. of sodium chlorate or boron trioxide alone or mixed or 640 lbs. of amate per acre will effectively eliminate leafy spurge. (Contributed by the Agronomy Department, South Dakota Agricultural Experiment Station, State College Station, South Dakota).

FIELD BINDWEED

Summary

J. W. Zahnley

Seven experiments were reported from three stations on the control of field bindweed. These included rates and time of applications of 2,4-D and the use of chemicals in combination with intensive cultivation and cropping systems. Results also with soil sterilants and various formulations of selective herbicides were reported.

Applications of 1/2 to 1 pound of 2,4-D acid to the acre in the bloom stage on fallow land resulted in complete kills of bindweed at Morden, Manitoba in 1951. In 1952 1/2 pound of 2,4-D ester and 3/4 pound of MCP amine were fully effective.

Applications of 1 pound of acid equivalent in all formulations tested was superior to 1/2 pound at College Station, Texas. In these tests propylene glycol butyl ether esters of 2,4-D, butoxy ethanol ester of 2,4,5-T and tetrahydrafurfyl esters of 2,4-D were most effective.

Results with soil sterilants applied in April and evaluated in October of the same year showed that bindweed survived treatments of 16 pounds concentrated borascu, 40 pounds of calcium borate, 5 pounds of sodium chlorate per square rod and 40 pounds of CMU per acre, after approximately 8 inches of rain during the six month period. Further observations should be made a year or more after the treatments. On plots treated with CMU in March 1951 only those treated with 80 pounds per acre were free from bindweed in October 1952. One year after the treatment and with 20 inches of rainfall during the period the CMU was found to be concentrated in the upper 4 inches of soil but with some toxic effect extending to a depth of 12 inches.

The number of cultivations required to control bindweed was reduced by application of 2,4-D in the spring after a full season of intensive cultivation. There was no saving of cultivation when the chemical was applied the first season. Spraying actively growing bindweed in the fall prior to wheat seeding gave good control. Fall application of 2,4-D prior to seeding oats in the spring gave fair control on the experimental field at Canton, Kansas. The use of 2,4-D with a reduced number of cultivations at the Texas station had the advantage of reducing erosion by permitting some growth of grasses which served as a soil cover.

Abstracts of Results of Cooperators

Effect of chemical herbicides on field bindweed (Convolulus arvensis) when applied at three rates and two seasons of the year in crops and on summerfallow. Breakey, W. J. In 1951 a 10 acre field of summerfallow heavily infested with field bindweed was sprayed August 22 using ester at rates of 6, 12 and 16 ozs. acid equivalent per acre in 8 gallons of water. The bindweed was 75% in bloom. Results showed that the bindweed was practically 100% eliminated at all rates. In June 1952 triplicate plots 15' x 8' seeded to oats were treated with the ester and amine of 2,4-D and the amine of MCP. The ester of 2,4-D was applied at 6 and 8 ozs. and the amine at 8 ozs. and the amine of MCP at 6, 8 and 12 ozs. acid per acre. Application was made with a small 8' boom sprayer at 35 lbs. pressure. The sprayer was equipped with pressure tank and a speedometer. In August 1952, 3 different 10 acre fields of summerfallow were sprayed using 2,4-D ester at 6, 12 and 16 ozs. of acid equivalent per acre. Application was made by a large 30' boom power sprayer at 35 pounds pressure using both 4 and 11 gallons of water. From

this year's results it would appear that heavier rates are required to eradicate bindweed in crops than on summerfallow. The 8 ozs. of 2,4-D ester and 12 ozs. of MCP amine gave excellent results, killing the bindweed 100%. Six ozs. of ester on summerfallow proved equal to 8 ozs. of ester when sprayed on bindweed in crops. Excellent kills were again obtained this fall by spraying bindweed on summerfallow with 12 and 16 ozs. ester per acre in both 4 and 11 gallons of water. At the 6 oz. rate the kill was not as effective as at the higher rates. Four weeks after spraying all bindweed plants were completely killed. (Contribution of the Dominion Experimental Station, Morden, Manitoba.)

Rates and formulations study of translocated selective herbicides on field bindweed. Grassaway, James E., Rea, Homer E., and Whitfield, Charles J. In replicated plots, field bindweed was treated at the early bloom stage, May 28, 1952, with 1/2 and 1 lb. acid equivalent rates of 2,4-D, 2,4,5-T and MCP. Evaluations of these treatments in October 1952, showed 1/2 lb. treatments to be inferior to 1 lb. treatments. With 2,4-D compounds the isopropyl ester at 1/2 lb. gave no control and at 1 lb. gave 33% control. An emulsifiable formulation of 2,4-Dichlorophenoxy-ethanol gave 0% and 29% control for the 1/2 and 1 lb. rates. Propylene glycol butyl ether esters of 2,4-D gave control of 29% and 66% at the 1/2 and 1 lb. rates. At 1/2 lb. the alkanolamine salts of the ethanol and isopropanol series of 2,4-D was ineffective, but 1 lb. gave 50% control and 1 1/2 lb. (used only with this formulation) gave 83% control. A water emulsifiable 2,4-D (ACP-638) gave 23% control at each of the two rates. A wax emulsion of 2,4-D (DW10-353) gave 0% and 55% control at 1/2 and 1 lb. rates. Tetrahydrafurfyl esters of 2,4-D gave 5% and 54% control at the two rates. 2,4,5-T butoxy ethanol esters gave 70% and 77% control at 1/2 and 1 lb. rates; tetrahydrafurfyl esters gave 62% and 79% control. A wax emulsion of 2,4,5-T (DW10-354) gave 15% and 45% control for the two rates. Propylene glycol butyl ether esters of MCP gave 23% and 31% control. Butoxy ethanol esters of MCP gave 36% and 59% control and the alkanolamine salts of the ethanol and isopropanol series of MCP gave 4% and 45% for the 1/2 and 1 lb. rates. Square foot samples were excavated to 8 inch depths from each plot and counts of live roots were made five months after treatments as the basis for the percentage values. (Contribution of Texas Agricultural Experiment Station.)

Soil sterilant applications as fence row treatments. Grassaway, James E., Rea, Homer E., and Whitfield, Charles J. Applications of soil sterilants made in April 1952 were evaluated in October 1952. Results with 16 lbs. of commercial concentrated borascu per square rod, show western wheatgrass, little barley, annual bromes and puncture vine to be susceptible. Johnson grass, field bindweed and kochia were semi-tolerant. Five lbs. of commercial sodium chlorate eradicated western wheatgrass, perennial ragweed, Johnson grass and puncture vine; while field bindweed, blue grama, kochia, silverleaf nightshade and green foxtail were semi-tolerant. Eighty lbs. of active ingredients of CMU per acre eradicated western wheatgrass, kochia, field bindweed, Johnson grass, little barley, annual bromes and puncture vine. No weeds survived this treatment. Forty lbs. of active ingredients of CMU per acre eradicated kochia, little barley, annual bromes, puncture vine and western wheatgrass; but Johnson grass, field bindweed, blue grama and Russian thistle survived this rate. Forty lbs. of commercial calcium borate per square rod eradicated kochia, Johnson grass and western wheatgrass; but failed to eradicate silverleaf nightshade and field bindweed. Twenty-five lbs. of commercial calcium borate eradicated stands of kochia, annual bromes, little barley and western wheatgrass; but failed to reduce stands of field bindweed and Johnson grass. These evaluations are of a preliminary nature and later data will be more conclusive. Rainfall from April 1, through October 15, approximated 8 inches. (Contribution of Texas Agricultural Experiment Station.)

Rates of CMU on field bindweed. Grassaway, James E., Rae, Homer E., and Whitfield, Charles J. Zero, 40, 60 and 80 lbs. of active CMU were applied to square rod plots of field bindweed March 17, 1951. Straggling plants survived that season in all treatments with some growth appearing in the 40 and 60 lb. plots in 1952. The plot treated with 80 lbs. has been free of all vegetation this year. Bindweed counts in these plots in October 1952, showed the check contained 25 plants per square meter. Forty lb/A CMU plot contained 2.5 plants per square meter. Sixty lb/A plot contained 2.0 plants per square meter; and the 80 lb/A plots with 0.0 plants per square meter. Plant counts were based on 2 square meter average. Soil borings were taken from each plot on February 13, 1952, sampling each 4 inch vertical zone. Nine samples were taken from each plot boring to a total depth of 36 inches. Individual samples were potted and planted to sorghums. External morphological responses of the sorghum seedlings showed CMU toxicity to be concentrated in the top 4 inches of soil after approximately 20 inches of rainfall. Soil samples removed from 4 to 8 inch and 8 to 12 inch depths were toxic to the sorghum seedlings but to a lesser degree of injury. Beyond these depths no effect from CMU was noticeable on the seedlings. (Contribution of Texas Agricultural Experiment Station.)

Control of field bindweed by intensive cultivation with cropping and translocated selective herbicides. Grassaway, James, E., Rea, Homer E., and Whitfield, Charles J. Twelve replicated field bindweed control treatments in 1/20 acre plots were initiated in 1949 with each practice carried out as scheduled through the growing season of 1952. In 1950 another replicated series of 12 duplicating studies were begun and in 1951 still another. Of the 12 treatments used, 4 have been outstanding and are presented below in tabular form. Flat 24 inch sweeps were used every 10 days after field bindweed emergence at 3 to 4 inch depths for the cultivations. 2,4-D was applied as often as needed. Rates depended upon soil moisture present at the time of treatments and ranged from 1/2 to 1 lb. acid equivalent per acre.

Practice	Number of Operations			Per Cent Control			Three Series Average
	1949 thru 1952	1950 thru 1952	1951 thru 1952	1949 Series	1950 Series	1951 Series	
Non cropped 2,4-D as needed	7	6	4	97.0	100.0	97.4	98.1
15 mo. cultivation followed by wheat	21	12	12	89.4	97.7	100.0	95.7
2,4-D on wheat at tillering stage	4 cult. 4 appl. 2.4-D	5 cult. 2 appl. 2,4-D	4 cult. 1 appl. 2,4-D	93.0	84.3	92.6	90.0
Continuous cultivation	22	16	10	98.6	66.9	98.6	88.0

Other treatments less successful include forage sorghums with early spring and late fall cultivations. Wheat with late spring and summer cultivations and forage sorghums with fall sprays of 2,4-D after harvest. A tremendous advantage evident in the continuous use of 2,4-D was the weedy grass cover that developed during the control program which reduced the hazards of wind erosion. The practice of wheat followed by 15 months cultivation gave excellent field bindweed control, and on wheat years gave cash returns and provided wheat stubble which was necessary to control wind erosion throughout the year of cultivation. Wheat with 2,4-D as

needed permitted cash returns and provided adequate control. Cultivation offered a more suitable method of control when soil moisture was limited and field bindweed was not responsive to 2,4-D. (Contribution of Texas Agricultural Experiment Station.)

The effect of combinations of 2,4-D and intensive cultivation in eradicating field bindweed. Russ, O. G., and J. W. Zahnley. The third set of plots involving the use of 2,4-D and intensive cultivation in controlling field bindweed have been completed. The treatments varied from spraying in the spring followed by intensive cultivation as needed to spraying in the spring following one full season of intensive cultivation. One-half of each plot was sprayed with one and one-half pounds of sodium salt per acre and the other half with one and one-half pounds of an ester formulation. There appeared to be no advantage of one formulation over the other. Those plots which received a treatment of 2,4-D sometime during the first season have required essentially the same length of time and number of cultivations to complete eradication as intensive cultivation only. The number of cultivations required may be reduced by spraying in the spring after one full season of cultivation. (Contribution of Kansas Agricultural Experiment Station.)

Control of field bindweed by the use of 2,4-D and different cropping systems. Russ, O. G. and J. W. Zahnley. Experiments in progress for the past 5 years have shown that field bindweed can be controlled by the use of 2,4-D and certain cropping systems. The first treatments to be carried to completion were those which have had continuous atlas sorgo either drilled or listed as the cropping system. Spraying at full emergence of bindweed in listed sorgo has given good control whereas spraying before listing has not been as effective. As the vigor of the bindweed plant is decreased, emergence is also delayed thereby resulting in lack of full emergence at the time it is necessary to spray before planting. Complete coverage is difficult when spraying in drilled sorgo that has made considerable growth. Spraying before wheat seeding on actively growing bindweed has given good control. Spring treatment in wheat may result in crop injury, especially after the vigor of the bindweed plant has been decreased causing full emergence to occur at a time when wheat is in a susceptible stage. This same condition exists when treating oats in the spring. Fall treatment of bindweed before planting oats in the spring has given fair control. No damage has occurred in crops that were seeded after spraying where the seeding was delayed until two weeks after a good rain following the treatment. 2,4-D was applied at the rate of one and one and one and one-half pounds of acid per acre. The one pound rate was used when spraying in crops. (Contribution of Kansas Agricultural Experiment Station.)

CANADA AND PERENNIAL SOW THISTLE

Summary

J. Roe Foster

Reports submitted in 1952 served to emphasize earlier findings that Canada Thistle cannot be eradicated with one treatment of 2,4-D, 2,4,5-T or M.C.P. There is evidence again that repeated light rates of application are more effective on Canada Thistle than one heavy dosage applied at one time. Applications made at the bud stage or early bloom stage were more effective than at any other stage. Applications made in the dormant stage were ineffective. Ester formulations were more effective on Canada Thistle and Perennial Sow Thistle than amines or MCP, especially in preventing regrowth.

One report showed repeated applications over a 4 year period up as high as 6 lbs./A rates only controlled Canada Thistle from 40 to 70 percent. Stands on untreated check plots increased 155 percent over the same period.

Light applications of esters and amines of 2,4-D were used to successfully retard perennial sow thistle in oats and also prevented seed setting of the thistle.

Heavy applications of from 2 lbs./A to 32 lbs./A of esters and amines of 2,4-D and 2,4,5-T were applied as a pre-emergence treatment on June 5th to land infested with Canada Thistle and which had been prepared for corn planting. 85 to 90 percent control was secured from the 16 and 32 lbs./A rates.

TCA was relatively ineffective on Canada Thistle at the 100 and 200 lbs./A rates. 500 lbs./A rate gave 100 percent control in 1951 but 40 percent regrowth appeared in 1952 on this area.

CMU gave good control of Canada Thistle at 40 and 80 lbs./A. Applications up to 20 lbs./A showed heavy regrowth after one year. Toxic amounts of CMU could be found in the soil to a depth of 12 inches where fall applications were made at 40 and 80 lbs. per acre.

There are indications that tillage combined with 2,4-D applications at the proper time is more effective for eradication and control of Canada Thistle than either of these methods alone. Perennial Sow Thistle is more susceptible to 2,4-D over a wider growth stage than Canada Thistle from a control point of view.

Abstracts of results of Cooperators.

Four years' results of Canada Thistle control with 2,4-D Bohmont, Dale W. Triplicate square rod plots were established in a heavy infestation of Canada Thistle in 1948. Treatments were made at the bud stage of growth each year with 2,4-D ester and amine salt at an acid equivalent of 2, 3, 4 and 6 lbs./A. the 3 lb/A amine was also applied with a detergent at 2% by weight. Stand counts of 3 sq. ft. each treatment rep were made at the beginning of the experiment and at the same time and location each year thereafter. All materials were applied in 40 gals. of water per acre. After 4 continuous years of 2,4-D application no treatment had completely eradicated thistle. The percentage control resulting from the different concentrations of 2,4-D varied from year to year. The only treatment which was statistically significantly better than the average of all treatments each year was the 2 lbs./A amine. The 3rd and 4th year treatments with 6 lbs. of 2,4-D amine and ester were also better than the average of all treatments at the

5% level of probability. The amine formulation at rates of less than 6 lbs/A were statistically more effective in controlling the thistle than comparable rates of the 2,4-D ester. Addition of a detergent to the 3 lbs. amine treatment reduced the efficiency of the chemical. The Canada Thistle stand in untreated control increased 155% over the 4-year test period, or an increase in stand count from 13 thistle plants per sq. ft. to 21 plants per sq. ft. All treatments and materials regardless of concentration controlled between 40 and 70% of the original stand after 4 years treatment. Contribution of Wyoming Agricultural Experiment Station. Laramie, Wyoming.

Effects of CMU (3-(p-chlorophenyl)-1,1-dimethyl urea) on Canada thistle (Cirsium arvense). Burt, E. O., Hill, G. D., and Willard, C. J. These observations were made during the summer of 1952 of plots treated in 1951 (Research Report 1951, p. 1) with CMU (80% technical material) at 0, 20, 40, and 80 lb/A, at four stages of growth -- rosette (April 20, 1951), and bud (May 29), rosette after mowing (July 6), and 10 inches of fall growth (September 5). Thistle sprouts were abundant in all plots treated at the 20 lb. rate. The 40 and 80 lb. rates resulted in 84 and 96 percent top kill, respectively. With the exception of Canada thistle, crabgrass was the first species to appear in abundance. It covered all but one replication of the plots treated at 40 lb./A and a few clumps appeared on those treated at 80 lb. A few dandelions also appeared in the 40 lb. plots. In addition to these, curled dock (Rumex crispus), nutsedge (Cyperus esculentus), narrow-leaf plantain (Plantago lanceolate), and broadleaf plantain (P. major) appeared in plots treated with 20 lb./A. There were more weeds on the spring-treated than on the fall-treated plots. A bio-assay with corn and soybeans, conducted in June and July 1952 with soil from the treated plots, indicated that the surface layer (0-4 in.) was much more toxic than the lower layers. In general, toxicity decreased as depth of soil increased. CMU was present at a depth of 8 to 12 inches in plots treated in the fall at the 20 lb. rate. CMU was present in very small amounts, if at all, at depth of 8 to 12 inches in plots treated in the spring at the 20 lb. rate. Toxic amounts of CMU were present in the 4 to 8 and 8 to 12 inch zones in all plots treated at the 40 and 80 pound rates. Ohio Agricultural Experiment Station.

Herbicides and adjuvants on Canada thistle. Hill, Gideon D. and Willard, C. J. Canada thistle plots were treated in May 1951 and 1952, when thistles were 10" - 14" high, and in August 1951 and 1952, when the regrowth after mowing these plots reached a height of 5" - 6". The treatments are listed on page 2 of the 1951 NCWCC Research Report. Ratings in terms of percent reduction of stand were made on May 1, July 23, and September 20, 1952. A final rating will be made in May 1953. Quackgrass was a medium to severe competitor of thistle throughout this study. The 100 and 200 lb./A rates of TCA did not injure thistle but controlled quackgrass, so that thistle was more vigorous on these plots than in check plots. The adjuvants (sucrose, Tween 20, Vitamin K) did not give increased control of thistle. The 1/4 lb./A rates were definitely inadequate (30% stand reduction). The 1/2 lb. rates, especially those applied as intermittent doses, gave better control of thistle than high rates (1½, 5, 10, and 20 lb./A) during the first year (May 1951, ratings). These differences were erased at the end of the second year, when all these rates showed at least a 95 percent stand reduction. Studies on depth of root kill indicated that 1/2 lb./A of amine 2,4-D, applied 1/16 lb. every 2 days for 8 times, killed the roots to a depth of 7 inches. This was correlated directly with slow-death of above-ground parts. Isopropyl ester of 2,4-D at 1/2 lb./A, applied 1/8 lb. every 4 days, 4 times, gave 25 percent better control thistle than 1/2 lb. applied at one time. Both the amine and ester forms of 2,4-D at 1½ pounds caused a 98 percent stand reduction by September, 1952. Amine salt of 2,4,5-T with only a 50 percent reduction in stand after one year was definitely inferior to similar rates of

amine 2,4-D was as effective as amine MCP at all rates. Sodium chlorate (500 lb./A at only one application) gave almost complete control of thistle in 1951, but with no retreatments these plots contained a 40 percent infestation in September 1952. If the area had been in cultivation (corn, e.g.) in 1952 there would have been little if any infestation at this time. (A more complete report was presented at meeting of the American Society of Agronomy, November, 1952, at Cincinnati, Ohio. Ohio Agricultural Experiment Station.

Effect of pre-emergence 2,4-D and 2,4,5-T on Canada thistle. Hill, Gideon D., and Willard, C. J. Triplicated plots, immediately after being prepared for corn planting, were treated on June 5, 1952, with the amine salt of 2,4-D and the polypropylene butyl ether esters of 2,4-D and 2,4,5-T at rates of 2, 4, 8, 16 and 32 lb./A, acid equivalent, in 40 gpa water. Low moisture at time of application reduced the effectiveness of these treatments. No definite conclusions on percent reduction of stand can be drawn until the spring of 1953. At equal rates, the polypropylene ester of 2,4-D was more effective than amine 2,4-D, which was in turn more effective than 2,4,5-T. Very few thistles came through the soil at the 32 lb. rates of 2,4-D. The 16 lb. rates of 2,4-D gave control (85-90 percent) comparable to 32 lb. of 2,4,5-T. Two pounds of polypropylene ester of 2,4-D, applied to some of the 16 and 32 lb. plots on August 26, 1952, gave complete control of above-ground thistle growth. One month later a multitude of thistle sprouts appeared in these plots. This excessive regrowth did not appear in areas which received 16 or 32 lb. in June, but no retreatment. Digging of roots showed that the numerous sprouts started from the horizontal rootstocks, at about an 8 inch depth. Applications of much the same materials and rates on dormant unplowed thistles on March 21 were relatively ineffective. Ohio Agricultural Experiment Station.

Effect of Systemic Herbicides on Canada Thistle in pre-bud stage, 1952. Pavlychenko, T. K. and Bestrop, A. J. Square rod plots of Canada Thistle (Cirsium arvense) growing on low land were treated in the late pre-bud stage with 1½ and 3 lb/A rates of ethyl ester of 2,4-D (Weedone Concentrate, Weedone Concentrate "Dilute"), low volatile butoxy ethanol ester of 2,4-D (Weedone LV4, Weedone LV4 "Dilute" and ACP129), amine salts of 2,4-D (Weeder 64 and ACP127), amine salt of MCP (Weedar MCP), pentasyl ester of 2,4-D (ACP649), mixture of low volatile butoxy ethanol esters of 2,4-D and 2,4,5-T (Brush Killer 32) and ester of Para (ACP903), and mixtures of acids of 2,4-D and 2,4,5-T (ACP926). RESULTS: Vegetative buds in Canada Thistle are deep and coming up late. Many of these buds escape the surface treatment unless the chemicals translocate to their depth. It is important to bear in mind that the regrowth in this experiment came up mostly from depths beyond the level of translocation. The chemicals that gave practically 100 pct. top kill at the 2 rates and translocated to the greatest depths and lateral distances (5 to 8 in) were Weedone Concentrate, Weedone Concentrate "Dilute", Weedone LV4, Weedone LV4 "Dilute" and ACP129. The vertical and lateral roots were strongly discoloured and buds swollen although not completely dead at the time of recording. Regrowths ranged from 8 to 48 pct. ACP649, Weedar 64, ACP127, 926 and Brush Killer 32 killed the top growth from 83 to 97 pct. and translocated from 3 to 5 in. down and sideways. Discolouration and swelling of roots was much less pronounced and regrowth ranged from 4 to 44 pct. Of the four chemicals in this group ACP649 gave the lowest pct. (5) in regrowth. Weedar MCP and ACP903 were the least effective chemicals on this weed. Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.

Effect of Systemic Herbicides on perennial Sow Thistle in late bloom stage, 1951-1952. Pavlychenko, T. K. On August 2nd, 1951, sq. rod plots of perennial Sow Thistle (Sonchus arvensis) in a low-lying area on abandoned land were treated once with ethyl ester (Weedone Concentrate), butoxy ethanol ester (LV4), pentasyl ester

(ACP649) and amine salts (Weedar 64 and ACP127) of 2,4-D; amine salt of MCP (Weedar MCP) and a mixture of butoxy ethanol esters of 2,4-D and 2,4,5-T (Brush Killer 32) at 2 and 4 lb/A in 70 gal. of water per acre. The stand was uniform and dense, ranging from 200 to 225 plants per sq. yard. The plants were in the flowering stage. The 1951 results were listed in the 1951 NCWCC Research Report. No further treatments were given in 1952. The final counts on regrowth were taken in the fall of 1952.

RESULTS: The original top growth was killed from 85 to 100 pct. by most treatments. Amine of MCP gave the lowest pct. of top kill (10%). Toward the fall of 1952 regrowth occurred in all plots and was of two types: shoots from the surviving perennial roots after the treatments in 1951, and new seedlings. The percent regrowth in the Table below indicates the new shoots. Seedling plants were omitted, as they had no bearing on the effectiveness of the chemicals. The treatments with Weedone LV4 gave the highest kill and only 9,4 and 7 pct. regrowth was recorded at the 2 and 4 lb/A rates respectively. The next best was Brush Killer 32 at both rates followed by pentasyl ester and ethyl esters of 2,4-D. Amine salts of both 2,4-D and MCP were inconsistent and with one exception gave the highest pct. regrowth. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

Effect of Systemic Herbicides on Perennial Sow Thistle in pre-bud stage, 1952. Pavlychenko T.K. and Bestrop A.J. Square rod plots of perennial Sow Thistle (Sonchus arvensis) on low land were treated in the early pre-bud stage with 1 and 2 lb/A rates of ethyl esters of 2,4-D (Weedone Concentrate and Weedone Concentrate "Dilute"); low volatile butoxy ethanol esters of 2,4-D (Weedone LV4, Weedone LV4 "Dilute" and ACP129), amine salts of 2,4-D (Weedar 64 and ACP127), amine salt of MCP (Weedar MCP), pentasyl ester of 2,4-D (ACP649) mixture of butoxy ethanol esters of 2,4-D and 2,4,5-T (Weedone Brush Killer 32), mixture of 2,4-D and 2,4,5-T acids (ACP926) and ester of para(ACP903). Records were taken 74 days after treatments and the percentage of regrowth calculated in terms of the weed population taken prior to treatments.

RESULTS: Of the twelve chemicals used Weedone Concentrate "Dilute" and ACP129 gave 100 pct. top kill and no regrowth at both rates. Weedone LV4, Brush Killer 32, Weedone Concentrate, ACP127, 926 and 649 also produced 100 pct. top kill and only 0 to 1 pct. regrowth. ACP903, amines of MCP and 2,4-D (Weedar 64) gave a very high but incomplete top kill and produced from 1 to 8 pct. regrowth. Different chemicals showed a distinct variation in their ability to translocate through the lateral and vertical roots. Butoxy ethanol esters were the best and MCP the weakest in this respect. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

Effect of 2,4-D and MCP on perennial sow thistle (Sonchus arvensis). Keys C. H. and Friesen H. A. On June 27th, 1952 butyl ester, amine and sodium salt formulations of MCP and the isopropyl ester and alkanolamine amine of 2,4-D were sprayed at dosages of 4 and 6 ounces of acid per acre on oats infested with patches of perennial sow thistle. The oats were in the very early shootblade stage and the thistles were some 8 inches tall at the time of spraying. Each formulation resulted in excellent kills of the top growth of the sow thistle. The top kills with either 2,4-D amine or ester ranged from 95 to 100%. The MCP formulations were almost as effective, the top kills ranging from 80 to 90 percent. On September 3rd there was no regrowth on the 2,4-D treated plots. The MCP ester and amine plots had from 1 to 7 percent regrowth and the MCP sodium salt had 9 percent regrowth. In order of effectiveness the formulations were 2,4-D ester and amine, MCP ester, amine and sodium salt respectively. The treatments were laid down in strips one rod in width, the sow thistle patches covered only some 8 percent of the plot area. Yield data did not show any increase or decrease in the yield of the treated strips when compared with adjacent untreated checks. This was likely due to the uneven infestation of the thistle. (Contributed by the Dominion Experimental Station. Scott, Sask.)

HOARY CRESS, RUSSIAN KNAPWEED, TOADFLAX AND ALL OTHER UPLAND PERENNIAL HERBACEOUS WEEDS

Robert T. Coupland

Summary

Thirteen abstracts were received concerning control of these weeds, ten of them being concerned with one of the three major persistent species included in this subproject.

Hoary cress. 2,4-D and mixtures of 2,4-D and 2,4,5-T at rates of from 1 to 6 lb./A. were reported to be effective in killing top growth, but regrowth occurred. One report was to the effect that, while the 4 lb./A. rate was not much more superior in killing of top growth than 2 lb., more discoloration of the vertical roots resulted (as deeply as 4 in.).

Russian knapweed. Killing of top growth was reported by 2,4-D, a mixture of 2,4-D and 2,4,5-T, and MCP at rates of ½ to 4 lb./A., but in no instance was killing of plants reported. Roots were reported to be killed to depths as great as 3 in. by some treatments. Polybor chlorate at 2560 lb./A. and sodium chlorate at 800 lb./A. were reported to eliminate Russian knapweed, but 15 to 25% regrowth resulted from amate at 480 lb., CMU at 80 lb. and trichloroacrylate at 80 lb./A.

Toadflax. Reduction of 90% in the stand of toadflax was reported by the use of 2 to 3 lb./A. of 2,4-D over a four year period after the infestation had been seeded to crested wheat grass. CMU at 80 lb./A. was the most promising of the soil sterilants used, causing top growth to be eliminated for two successive seasons following one treatment. Alternation of intensive tillage and cropping has been successful in reducing stands of toadflax to the extent that crops can be profitably grown.

Other weeds. Short reports of the effect of various herbicides on wild garlic, bracken and field horsetail indicated only partial success in controlling these species.

Abstracts of Results of Cooperators

Hoary Cress

Hoary cress. McCurdy, E.V. For the past three seasons some well established patches of hoary cress have been treated with a butyl ester of 2,4-D at approximately 2 lb./A. The weeds showed very little regrowth in 1952 but two applications were made during the season to the few remaining plants. At the end of the season the odd plant was still making some regrowth but the weed had been controlled to the extent that a crop could be grown in competition with this weed. (Contributed by the Dominion Experimental Farm, Indian Head, Sask.)

Effect of various systemic herbicides on hoary cress, 1951-1952. Pavlychenko, T.K. Replicated sq.-rod plots, in an established stand of hoary cress (Lepidium draba) were treated at the flowering stage on July 9th, 1951, with 1 and 6 lb./A. rates of ethyl ester of 2,4-D (Weedone Concentrate), pentasyl ester of 2,4-D (ACP649), low volatile butoxy ethanol esters of 2,4-D (Weedone LV4) and amine of 2,4-D (ACP127). The soil was clay loam and the population of hoary cress varied from 37 to 108 plants per sq. yard. Preliminary results were reported on page 26 of the 1951 NCWCC Research Report. Final notes on regrowth were taken in September,

1952. RESULTS: The infestation was seeded to wheat in 1952. After the crop was harvested, regrowth of hoary cress was apparent, although retarded by the crop. The regrowth was originating from old viable roots incompletely killed by the 1951 treatments. The plots treated with Weedone LV4 showed the least regrowth, namely 30 and 25 pct. of the original population, at the 1 and 6 lb./A. rates respectively. Weedone Concentrate allowed regrowths of 54 and 30 pct. at the two rates. The corresponding figures for regrowth and the two rates in ACP649 plots were 60 and 50 pct., and ACP127 plots 80 and 75 pct. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

Effect of Systemic Herbicides on hoary cress, 1952. Pavlychenko, T.K. and A.J. Bestrop. Square-rod plots of hoary cress (Lepidium draba) growing on summerfallow that was cultivated July 1st, were treated August 5th in the late pre-bud to early flowering stage with 2 and 4 lb./A. rates of ethyl esters of 2,4-D (Weedone Concentrate and Weedone Concentrate "Dilute"), low volatile butoxy ethanol esters of 2,4-D (Weedone LV4 and ACP129), pentasyl ester of 2,4-D, (ACP649), acids of 2,4-D and 2,4,5-T (ACP926), esters of 2,4-D and 2,4,5-T (BK32) and ester of para (ACP903). RESULTS: Forty three days after treatment, it was noted that all plots showed some regrowth, ranging from 1 pct. with Weedone Concentrate "Dilute" 4 lb./A. to 11 pct. of the original population with BK32 2 lb./A. With all the chemicals the 4 lb./A. rate did not appear to be much more superior in killing the top growth than the 2 lb./A. rate, but it produced more discoloration on the vertical roots. The chemicals may be divided into two general groups. The first group (Weedone LV4, Weedone Concentrate, ACP129, Weedone Concentrate "Dilute" and ACP649) caused average topkills ranging from 100 to 88 pct. and serious discoloration of vertical roots to various depths. In the second group (ACP912, ACP926, BK32 and ACP903) the average depth of vertical root discoloration from 1 to 0 in. In this group, the root discoloration was not so severe as in the first group. In 1953 further notes will be taken on the regrowth. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

Russian Knapweed

Russian knapweed control with soil sterilants. Derscheid, Lyle A. Duplicate 9' x 15' plots were treated at Wessington, South Dakota, in June, 1951, and near Newell, South Dakota, in September, 1951. Sodium chlorate was applied at the rate of 5 lb./sq. rd., borascu at 15, 20 or 25 lb./sq. rd., concentrated borascu at 5, 10 and 15 lb./sq. rd., Polybor at 4, 8 or 12 lb./sq. rd., polybor chlorate at 4, 8 and 12 lb./sq. rd., CMU at 10, 20, 40, 60 or 80 lb./A. and trichloroacrylate at 10, 20, 40 or 80 lb./A. Amate was applied at rates of 2 and 4 lb./sq. rd. on the Wessington plots. Minimum rates of chemicals that gave complete elimination are shown in the following table.

Chemical	Wessington in June	Newell in September
Polybor chlorate	12* - 16 lb./sq. rd.	8* - 16 lb./sq. rd.
CMU	None	80*lb./A.
Sodium chlorate	5 lb./sq. rd.	5 lb./sq. rd.
Trichloroacrylate	None	40* or 80*lb./A.
Amate	4*lb./sq. rd.	---

* These treatments gave 75 - 85% elimination.

(Contributed by the Agronomy Department, South Dakota Agricultural Experiment Station, State College Station, South Dakota).

Effect of several herbicides on Russian knapweed. McCurdy, E.V. For the past two years a butyl ester of 2,4-D and a mixture of esters of 2,4-D and 2,4,5-T were applied at ½ and 2 pound rates to plots of Russian knapweed in a replicated test. This year three applications have been required to control top growth. The heavy rate of the 2,4-D and the mixture of 2,4,5-T have resulted in a good kill of the top growth and quite marked reduction in the number of plants by the end of the season. Very little was accomplished with the light rate except to set back the plants temporarily. This weed has been growing in competition with brome and now that 2,4-D is being applied the brome is more than holding its own with the Russian knapweed. Twelve plots were broken in 1951 and an attempt was made to eradicate the weed by cultural methods. Nine cultivations were given to the plots this year and the growth appeared just about as strong this fall as it was in the spring. A low volatile ester of 2,4-D was applied to four plots that had been broken and an excellent kill of most of the top growth has resulted. There is less regrowth following this treatment than after any of the others. (Contributed by the Dominion Experimental Farm, Indian Head, Sask.)

Effect of systemic herbicides on Russian knapweed, 1952. Pavlychenko, T.K. and A.J. Bestrop. Replicated sq. rod plots of Russian knapweed, growing in a brome grass sod, were treated in the early flower stage with 2 and 4 lb./A. rates of ethyl esters of 2,4-D (Weedone Concentrate and Weedone Concentrate "Dilute"), butoxy ethanol esters of 2,4-D (Weedone LV4 and Weedone LV4 "Dilute"), pentasyl ester of 2,4-D (ACP649), 2:1 mixture of acids of 2,4-D and 2,4,5-T (ACP926), mixture of butoxy ethanol esters of 2,4-D and 2,4,5-T (Brush Killer 32), amine salt of 2,4-D (Weedar 64) and ester of MCP (ACP904). RESULTS: All the treatments gave top kill from 80 to 100 pct. Weedone LV4, ACP926 and Brush Killer 32 produced 100 pct. top kill at 4 lb./A. rates and gave 5, 17 and 7 pct. regrowth respectively. Their translocation was better than in other chemicals excepting ACP649 and LV4 "Dilute" that were also good translocators. ACP649, Weedone LV4 "Dilute", Weedone Concentrate and ACP904 closely followed the first group with respect to both top kill and translocation, excepting ACP904, which translocated to the roots poorly. Regrowth in this group was 17, 10, 3 and 18 pct. respectively. Weedone Concentrate gave top kill of 83 and regrowth 7 pct. and reasonably good translocation. Weedar 64 gave a top kill of 92 pct. but its translocation was weak and this resulted in the highest pct. (30) regrowth in this experiment. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

Toadflax

Effect of repeated applications of 2,4-D on toadflax (Linaria vulgaris) on land seeded down to crested wheat grass. Friesen, H.A. and C.H. Keys. A 2 acre plot, heavily infested with toadflax was seeded down to crested wheat grass in the late fall of 1948. In June 1949 one part was sprayed with an ester and the other part with an amine of 2,4-D. In 1950 the portion sprayed with the ester was divided into 4 strips and sprayed with an ester at dosages of ½, ¾, 1 and 1½ lb. of acid per acre, the amine treated portion was retreated with amine at 3 lbs. per acre. Regrowth was so heavy in the summer of 1950 that the strips treated with ½, ¾, 1 and 1½ lb. of ester were retreated in July 1950 at dosages of 1, 2, 3 and 4 lb. of ester per acre; the amine treated strip was also retreated but at 3 lb. per acre. In May of 1951 the strips were retreated with the same formula-

tions and at the same dosages that were applied on July of 1950. In June 1952 these treatments were again repeated. In October of 1952 the stand of toadflax on those strips sprayed with the amine at 3 lbs. and the ester at 2 lbs. per acre or higher was only some 10 per cent of the original stand. On the strip treated with the ester at 1 lb. per acre the stand of toadflax was 18 per cent. The crested wheat grass, in 1951, began to establish itself within the toadflax patches, in 1952 the grass became well established in the patches with the prospect that in 1953, the toadflax may be entirely crowded out. (Contributed by the Dominion Experimental Station, Scott, Sask.)

Effect of herbicides on toadflax (Linaria vulgaris). Friesen, H.A. and C.H. Keys. On May 25, 1951, sodium chlorate at 1, 2 and 3 lbs. per 100 square feet; CMU and sodium TCA at 20, 40, 80 and 100 lbs. per acre; polybor chlorate at 3 lbs. and borascu at 6 lbs. per 100 square feet; maleic hydrazide at 24 lbs. per acre and DNOSBP (general) at 10 gallons per acre in diesel oil were applied to a very dense stand of toadflax (400 plants per square yard) on land which had not been in crop since 1948. In October of 1952, two seasons later, regrowth on the plots treated with sodium chlorate and polybor chlorate at 3 lbs. per 100 square feet was 23 and 30 per cent of the original stand, respectively. Borascu, which was slow in entering the soil in 1951, showed only some 11 per cent regrowth in 1952. TCA, especially at the 80 and 100 lb. rates per acre looked very promising in the fall of 1951, but in the fall of 1952 the regrowth on these plots was up to 80 per cent of the original stand. Regrowth on the MH treated plots was equal to the original stand. There was no regrowth on the plot treated with DNOSBP in 160 gallons of diesel oil. Those plots treated with CMU at 80 and 100 lbs. per acre had absolutely no regrowth, while CMU at 20 and 40 lbs. had 9 and 1 per cent of regrowth, respectively. In the spring of 1952 a portion of each plot was roto-tilled to a depth of 3½ inches and sown to wheat. The grain grew and matured seed on each of the treated plots except the CMU at each dosage, and DNOSBP. Of the herbicides CMU appeared to be the most effective by a wide margin. (Contributed by the Dominion Experimental Station, Scott, Sask.)

Effect of an alternate fallow and grain rotation on the control of toadflax. Friesen, H.A. and C.H. Keys. In the spring of 1949 a rotation of alternate fallow and barley, designed to control and eventually eradicate a heavy stand of toadflax, was initiated. In the season of 1949, 14 shallow tillage operations were made. In 1950 the land was sown to barley. The intensive tillage in 1949 reduced the stand of toadflax in the 1950 crop by 90 per cent. In 1951 the land was again fallowed but only 8 shallow tillage operations were given. In 1952 the fallow was again sown to barley. Only a few isolated plants of toadflax were found in the crop at harvest time. In October of 1952 small toadflax plants were observed to be emerging, particularly in those areas where the well established patches of toadflax had flourished previously. Excavations showed that these plants had sprung from seed. Late fall tillage of the stubble in 1952 has been very effective in killing these seedlings. A similar rotation was begun in 1949 on a large field, 150 acres in size, and essentially the same control was realized. In this case wheat rather than barley was the crop used. This study would indicate that heavily infested fields can be brought under control by two cycles of alternate intensive tillage and cropping. The rotation, however, will have to run over a period of years depending on the length of seed dormancy, if complete eradication is to be achieved. (Contributed by the Dominion Experimental Station, Scott, Sask. 1952)

Effect of systemic and some contact herbicides on toadflax, 1952. Pavlychenko, T.K. and A.J. Bestrop. Toadflax (Linaria vulgaris) is a highly resistant weed to most herbicides available. Yet it is an important weed that continues to spread from waste places to agricultural lands. In view of this fact extensive tests were made with many systemic and some contact chemicals to find a remedy for its control. Replicated plots 16 x 16 ft. on a sand loam soil densely infested with the weed were treated in 1952 in the pre-bud stage at 2 and 4 lb./A. rates of mixture of 2,4-D and 2,4,5-T butoxy ethanol esters (Brush Killer 32), mixture of 2,4-D and 2,4,5-T acids (ACP926), polyethelene glycol ester of 2,4-D (ACP648), butoxy ethanol ester of 2,4-D (Weedone LV4), ethyl ester of 2,4-D (Weedone Concentrate), mixture of 2,4-D, 2,4,5-T and Para (ACP912), pentasyl ester of 2,4-D (ACP649) and at 20 and 40 lb./A. rates of 3-p-chlorophenyl-1-1-dimethylurea (CMU). Moisture was fair throughout the season. RESULTS: CMU gave 100 pct. top kill at the two rates used. Weedone Concentrate, ACP649 and Weedone LV4 "Diluto" produced top kill of 85, 80 and 80 pct. at 4 lb./A. rates respectively. The remaining chemicals were all less effective with top kill ranging from 30 to 75 pct. Regrowth was again the lowest (10 pct.) in CMU followed by ACP649 (13), Weedone Concentrate (17), ACP926 (21) and Brush Killer 32 (22 pct.). Other chemicals allowed more regrowth up to 66 pct. of original stand. All chemicals including CMU had only slight effect on permanent root kill at the end of first season. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

Other Upland Perennial Herbaceous Weeds

Effect of herbicides on wild garlic (Allium vineale). Hansen, J.R. and J.F. Freeman. Plots were located in fairly uniform stands of garlic growing in a mixed population of pasture grasses, legumes, and weeds. Herbicides and their rates were the butoxy ethanol ester, the ethyl ester, and alkanolamine salt of 2,4-D each at 2 lb./A; CMU at 0.5, 1, and 2 lb./A; endothal at 1, 2, and 4 lb./A. and diethanolamine salt of MH at 4 and 8 lb./A. All treatments, including unsprayed checks, were replicated four times in a completely randomized arrangement. Applications were made on April 30, 1951, on a warm sunny day. A wetting agent was added to CMU, endothal, and MH. MH was applied with a 20 gpa volume, and others were applied in 12.5 gpa. The 2,4-D formulations caused rapid chlorosis of the garlic and prevented formation of aerial bulblets. MH acted slowly, caused no chlorosis or necrosis, but prevented formation of aerial bulblets. Stand counts in 1952 indicated about 60 - 70% reduction by 2,4-D formulations, esters being more effective, and over 90% reduction by both rates of MH. Plants noted in the MH plots originated from aerial bulblets that possibly were carried in from adjacent areas. Other materials were ineffective in reducing stands of garlic. (Kentucky Agricultural Experiment Station.)

Studies on the control of bracken. Yoo, Richard R. and B.H. Grigsby. A total of 360 herbicides or mixtures of herbicides were applied to bracken fern in various stages of growth in the course of a two-year study. The materials were soil sterilants, contact herbicides and translocated herbicides. Dormant season applications of various boron compounds gave complete eradication only when the rate was 2,000 lb./A. or more. Ammonium sulfamate, at 480 lb./A. also eradicated the fern. Control, as shown by lack of frond development for 12 months, was obtained with either 160 lb./A. of sodium chlorate or ammonium sulfamate. Cutting the fronds prior to treatment had no apparent effect upon the results. Top kill was obtained with most of the mixtures used, but regrowth was rapid following treatment with all except chlorate and ammonium sulfamate. Translocation of growth regulating compounds into rhizomes was not found in any foliage

application. Application of 2,4-D and 2,4,5-T directly to the rhizome led to movement of the chemical in the rhizome for a distance of 20 to 25 feet. (Contribution from the Michigan Agricultural Experiment Station.)

Response of field horsetail to treatments with several chemicals. Wood, H.E., J.W. Garvin and W.D. Watson. On heavy clay soils about 40 miles west of Winnipeg heavily infested with field horsetail, Equisetum arvense, sq. rod plots were treated in May-June, 1952 as follows: Krilium (formulation 931) was applied at rates of .05% and .1% concentration by weight of soil, thoroughly working it to a depth of approximately 6 inches, then immediately seeding to barley. Plots were duplicated on a nearby farm. TCA at 10 lb. acid per acre and CMU at 4 and 40 lb. acid were knapsack applied, the soil remaining undisturbed until fall, when it was surface-tilled preparatory for next year's seeding. Krilium had no apparent effect upon the horsetail or did it increase the stand of grain. However, there was decided improvement in soil structure, especially on the plot receiving .1% concentration. As late as mid-August there was little or no effect of TCA or CMU on horsetail. By September 17th on the plot receiving 10 lb. TCA about 80% horsetail was dead (above ground), 40% dead on plot receiving 40 lb. CMU, and not more than 20% on 4 lb. CMU plot. Other weed growth, notably wild oats, but excepting ridge-seeded spurge, was all destroyed on the 40 lb. CMU plot, but not so on the other two plots. Further observation leads one to conclude that field horsetail infestations are confined almost entirely to areas and those portions of fields where drainage is lacking and where as a result of underlying sandy or gravelly soil, the water-table is near the surface and the soil is constantly moist. (Contribution of the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada.)

ANNUAL, WINTER ANNUAL AND BIENNIAL GRASSY AND BROADLEAVED WEEDS

Summary

R. S. Dunham

The abstracts indicate a major interest in the control of wild oats and foxtail (Setaria spp.) At the Uni. of Manitoba, good control of wild oats and green foxtail was obtained with endothal alone and combined with E.H. 5722 and IPC in post-emergence applications; CIPC was less effective on green foxtail both alone and combined with endothal; in pre-emergence treatments, wild oats were controlled by IPC and CIPC. Pavlychenko found pre-emergence applications of CIPC effective on wild oats and both foxtails. Wild oats stands were reduced 50% by endothal in trials by Mac Donald et al; better than 90% control resulted from 2 lbs. of CMU. Ebell and Corns found pre-emergence applications of TCA promising for wild oat control when made in spring or fall and IPC promising when applied in the fall; PCP and MH almost completely eliminated oats sown to simulate wild oats with no damage to barley and flax. Pre-emergence treatments of TCA practically eliminated wild oats for Coupland, CIPC was somewhat less effective, and CMU still less effective. L'Arrivee and Andersen, Pavlychenko, and Dunham et al found TCA effective on the foxtails. TCA at 3 lb/A eliminated giant foxtail (Setaria faberii) in Illinois trials. Wild barley was controlled by CMU in Bohmont's trials.

CMU was better than 2,4-D or TCA for control of Tartary buckwheat at the Uni. of Alberta. Pavlychenko reports 100% kill of Tartary buckwheat, corn cockle, hare's ear mustard and false flax with pre-emergence applications of CIPC and 94-100% reduction of stand, vigor, and dry wt. of wild buckwheat by 2,4-D. Wood et al conclude from their trials that 2,4-D ester gives a measure of Tartary buckwheat control in barley.

As the result of several trials, Coupland concluded that 2,4-D was more effective on Russian thistle than MCP and where infestations are heavy more than 4 oz. of the ester are needed. 2,4-D and MCP esters at 1 lb/A and Premerge at 12 qt/A applied pre-emergence reduced the stand of R. pigweed 75-90% for Coupland; pre-emergence treatments of 2,4-D and MCP esters at 1 lb/A and DNOSBP at 12 qt/A reduced the stand of purslane 50-75%.

Hauser sprayed several broadleaved weeds with various 2,4-D formulations and found indications of an interaction between formulations and species.

Dunham et al report on a comparison of MCP and 2,4-D sprayed on 40 spp. of annual and biennial weeds and on the effect of TCA on 5 spp. of grassy weeds.

Abstracts of Results of Cooperators

Chemical control of wild barley (Hordeum jubatum) Bohmont, Dale W. Triplicate 32 sq. ft. plots located on a heavy infestation of wild barley were treated in the 3-leaf (June 7) and the boot stages (July 3) of plant growth. The materials and concentrations used were as follow: CMU, 3 and 6 lbs/A, TCA, 10 and 20 lbs/A, IPC, 5 and 10 lbs/A, and PMA, 10 and 20% solutions. All materials were applied at 40 gal of water per acre. Periodic toxicity readings were taken for a period of 65 days following each set of treatments. Early spring treatments (leaves 1-3 inches long) were initially more damaging than similar concentrations applied at the boot stage of growth. PMA at 20% produced 100% initial top kill within 10 days of application; however, the treated plants recovered and produced seed heads within

the growing season. Light rates of PMA, IPC, and TCA were ineffective. TCA at 20 lbs. and IPC at 10 lbs/A caused some injury in the early treatments and reduced heading slightly, with 15 percent control resulting. Late treatments caused no measurable damage. CMU appeared the most promising of the materials and concentrations tested, over 86 percent control resulting from early application of the 6 lbs/A treatment. CMU 3 lbs/A treatment applied at the 3-leaf stage of growth controlled 25 percent of the established barley plants. (Contribution from Wyoming Agricultural Experiment Station. Laramie, Wyoming. Journal paper number 31.)

Effects of TCA, 2,4-D esters and CMU on Tartary buckwheat. Corns, W. G. On June 16, Tartary buckwheat at 3 to 5 leaf stage (3-5" tall) was sprayed in quadruplicate 100 sq. ft. randomized plots for each treatment. Sodium TCA was applied at 10, 25, 50 lb/A in 50 gal. water; 2,4-D ethyl ester (Weedone) and an experimental low volatility ester (Pittsburgh LV400) at 3, 6, 12 oz. acid equiv./A; CMU at 1, 5, 10 lb/A. Weekly plant counts taken until Aug. 22 in fixed square yard areas and fresh weights of 50 plants per plot recorded one month after treatments were as follows:

	Reduction in numbers in % of original No.			Reduction in weight in % of check wt.		
	Rate 1	Rate 2	Rate 3	Rate 1	Rate 2	Rate 3
TCA	19	7	15	26	56	69
2,4-D (ethyl)	5	11	23	0	39	54
2,4-D (LV)	21	9	48	11	53	72
CMU	13	74	93	45	71	84
Check - 30						

Again, as in 1951, the low volatility 2,4-D appeared somewhat more effective than standard ester on Tartary buckwheat. The effects of CMU are noteworthy apart from economical considerations. Current volunteer growth of barley, oats, and regrowth of annual weeds by August indicated no visual residual effects of chemicals tested, but more adequate tests of effects of CMU on grain are required. (Contributed by Department of Plant Science, University of Alberta, Edmonton).

Response of wild oats to soil treatments with granular cyanamid, CMU and TCA. Corns, W. G. With the aim of testing short-term soil-sterilization as chemical summerfallow, wild oats obtained from commercial screenings were sown on May 16 at 2 bu/A in spring-plowed land at Edmonton. Quadruplicate randomized plots were treated immediately after seeding. Treatments were granular cyanamid, rates 1, 2, 3; 200, 300, 400 lb/acre spread dry; CMU: 1, 5, 10 lb/A in 50 gal water; sodium TCA: 10, 25, 50 lb/A in 50 gal water. Soil was disced immediately after application of chemicals. First major rainfall occurred 5 days later. Fresh weights of wild oat plants on 66 square feet were taken soon after heading time and expressed as mean percentage of check yield (approx. 14 Tons/A) in the following table:

	Rate 1	Rate 2	Rate 3
Granular Cyanamid	96	100	93
CMU	105	109	94
TCA	80	50	24

TCA acted mainly by prevention of emergence and partially by gradually killing emerged plants. On plots kept nearly bare by Rate 3 TCA, there was abundant growth of pigweeds etc. after mid-summer. Work with TCA is being extended to include fall applications to wild oats followed by spring and fall grain crops. (Contributed by Department of Plant Science, University of Alberta, Edmonton).

Effects of various herbicides on wild oats (Avena fatua L.) when applied as pre-emergence sprays, 1952. Coupland, R. T. Rod-row plots of wild oats were treated with duplicate applications of the following herbicides on June 9 (three days after seeding): CIPC at 10, 20 and 40 lb/A. in 50 gal of water, TCA at 10, 20 and 40 lb/A in 20 gal of water, CMU at 1/2, 1, 2 and 4 lb/A in 50 gal of water and DNOSBP (Dow Premerge) at 4, 8 and 12 qt/A in 40 gal of water. Wild oats were practically eliminated by the TCA at 20 and 40 lb. Next in order of effect on wild oats were TCA at 10 lb., CIPC at 20 and 40 lb., and CMU at 4 lb. Other treatments did not result in effective control. All volumes are in Imperial measure. (Contribution from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

Relative effects of 2,4-D and MCP in control of Russian thistle (Salsola pestifer A. Nels.) in wheat, 1952. Coupland, R. T. Quadruplicated 7 rod-row plots of wheat in 6-inch spacings were sown on May 1 at Saskatoon. Treatment was made at three stages with 8 oz. of 2,4-D ester (butyl) and MCP ester (butyl) at three stages. The stages were: June 3, wheat 6 in. high; June 25, wheat 10 to 14 in. high, 4 to 5 leaves, 3 to 5 tillers; and July 16, wheat 25 in. high, headed. Volunteer weed stands were principally Russian thistle. The height of this weed averaged 3, 6 and 14 inches, respectively, before treatment on the three dates. The mean yield of wheat from MCP treated plots was 18% less than in the 2,4-D plots treated at the first stage. Comparable data for the second and third stages of treatment were a 10% decrease and 4% increase, respectively. The mean yield of straw at harvest was greater in MCP plots in all stages of treatment. These increases above the 2,4-D treated plots were 2, 14 and 6%, respectively, for the first, second and third treatment. The air-dry weight of weeds (above-ground parts) present at harvest was greater in the MCP treated areas, being increased 1128, 146 and 48%, respectively, above the plots treated with 2,4-D at the first, second and third stages. MCP would appear to be less effective in controlling Russian thistle than 2,4-D, but possibly is not as detrimental to wheat at the susceptible stages. (Contribution from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

Comparative effect of two rates of 2,4-D on Russian thistle in wheat, 1952. Coupland, R. T. Quadruplicated plots of wheat (7 rows, 1 rod long and 6 in. apart) were sown on May 1 at Saskatoon. Russian thistle (Salsola pestifer A. Nels.) was seeded on the same date between the rows. A heavy stand of weed resulted. This was treated with 2,4-D ester (butyl) at 0, 4 and 8 oz/A in 7.1 Imperial gal. of water at three stages: June 3 - wheat 6 in. high, weed 3 in.; June 25 - wheat 10 to 14 in., weed 6 in.; July 16 - wheat 25 in. and headed, weed 14 in. The yield of wheat from the first treatment date was reduced below the weed-free untreated check by 32, 25 and 17%, respectively, in plots treated at the 0, 4 and 8 oz. rates. Comparable data for the second stage of treatment were 49, 42 and 40%, and for the third treatment were 45, 32 and 30%. These yields reflect the degree of control of the weed as expressed in terms of air-dry weight of above-ground parts. Less weed growth remained at harvest in the 8 oz. plots being 15, 76 and 77% of that in the 4 oz. plots, respectively, in the first, second and third stages of treatment. The 4 oz. plots produced 58, 53 and 100%, respectively, of the weed

yield of the untreated weed-infested plots in the three dates of treatment. These data indicate that in heavy infestations of Russian thistle, applications greater than the 4 oz. rate most commonly used in this area are advisable. (Contribution from the Dept. of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

Effect of various herbicides on Russian thistle (Salsola pestifer A. Nels.) 1952. Coupland, R. T. Russian thistle was sown in 7 rod-row plots (6 in. between rows) at Saskatoon on May 1. 2,4-D and MCP were applied at 4 and 8 oz/A in 7.1 Imperial gal of water to duplicated plots in each of three stages of development of the weed. Stage 1, May 30 (10 leaves, 2 in. high); stage 2, June 13 (4 branches, 4 in. high); June 25 (12 branches, 8 in. high). Formulations of 2,4-D used were butyl ester, a mixture of amines (Naugatuck) and a low volatile ester. Butyl ester and amine of MCP were used. The overall effect in terms of reduction in stand and reduction of vigor were as follows from the most severe to the least severe (the average height in inches of surviving plants is shown in parentheses): 2,4-D ester 8 oz. (5), 2,4-D low volatile ester 8 oz. (5), 2,4-D ester 4 oz. (9), 2,4-D amine 8 oz. (9), low volatile ester 4 oz. (10), MCP ester 8 oz. (9), 2,4-D amine 4 oz. (10), MCP ester 4 oz. (12), MCP amine 4 and 8 oz. (13). This indicates the relatively low effect of MCP on Russian thistle compared with 2,4-D. The low volatile ester formulation of 2,4-D compares well with the butyl ester. (Contribution from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

A comparison of the effectiveness of two rates of 2,4-D on Russian thistle (Salsola pestifer A. Nels.) of different intensities of stand, 1952. Coupland, R. T. Quadruplicated 7 rod-row plots of wheat (6 in. between rows) were seeded at Saskatoon on May 1. Some were infested heavily the same day with seed of Russian thistle. The remaining plots were less heavily infested by volunteer seedlings. 2,4-D ester (butyl) was applied on three dates at 4 and 8 oz/A. The stages were: June 3, wheat 6 in. high, weed 3 in.; June 25, wheat 10 to 14 in. high, weed 6 in.; July 16, wheat 25 in. high and headed, weed 14 in. Mean yield of wheat in heavily infested plots was less than plots with volunteer stands treated at the same rate and stage. The reductions averaged 21, 30 and 23%, respectively, at the 4 oz. rate in the first, second and third stage. The corresponding reductions with the 8 oz. rate were 15, 19 and 30%. These data indicate that at usual rates of application of 2,4-D, the use of herbicide will not entirely overcome the depression in yield of crop resulting from the higher population of Russian thistle in very weedy land. This reduction in crop yield is associated with a greater production of weed tissue. Air-dry weights of weed produced in the very weedy plots treated with 4 oz. of 2,4-D averaged 18, 12 and 8 times greater, respectively, in the first, second and third stages than in the less weedy plots treated at the same rate. Comparable data for the 8 oz. rate were 3.5, 7 and 5. (Contribution from the Dept. of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

Effect of pre-emergence application of various herbicides on Russian pigweed (Axyris amaranthoides L.), 1952. Coupland, R. T. Russian pigweed was planted in duplicated 4 rod-row plots (12 in. between rows) on June 6 at Saskatoon. Pre-emergence applications were made two days later using 2,4-D ester (butyl) and MCP ester (butyl) at 1/2 and 1 lb/A in 7.1 gal. of water, DNOSBP (Dow Premerge) at 4 and 12 qt/A in 40 gal of water, TCA at 4 and 12 lb/A in 20 gal of water, and CMU at 1/2 and 2 lb/A in 50 gal of water. Reduction in stand of weed was similar (75 to 90%) from the higher rate of 2,4-D, MCP and DNOSBP. The 1/2 lb. rate of 2,4-D and MCP caused 30 to 40% reduction in stand. The 4 qt. rate of DNOSBP and

the higher rates of TCA and CMU caused 15 to 25% damage, while the lower rates of TCA and CMU reduced the stand less than 10% compared with the checks. The vigor of the surviving plants at flowering time was not noticeably affected in all plots as compared with the checks (ave. ht. 25 in.). The possibility of using heavy rates of 2,4-D, MCP and DNOSBP on alfalfa seed fields infested with Russian pigweed is suggested if application can be made without unduly affecting alfalfa. All fluid measurements are in Imperial measure. (Contribution from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

Relative effect of DNOSBP in various amounts of water on Russian pigweed (Axyris amaranthoides L.), 1952. Coupland, R. T. Russian pigweed was planted on June 6 at Saskatoon in duplicated 4 rod-row plots (12 in. between rows). DNOSBP (Dow Selective) was applied at 4 qt/A in 7, 14, 21, 42 and 84 gal of water on July 14 when the weed averaged 5 in. in height with 10 to 15 leaves. The immediate wilting and burning effect was most severe from the highest volume treatment and decreased with lower rates. While no reduction in stand was caused by the treatments, reduction in vigor was apparent. At flowering (Aug. 12), the average heights were 17,20,21,21 and 23 in. in plots treated respectively with 84, 42, 21, 14 and 7 gal. of solution. The average height in the check plots was 26 in. All fluid measurements are expressed in Imperial measure. (Contribution from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

Effect of pre-emergence application of various herbicides on purslane (Portulaca oleracea L.), 1952. Coupland, R. T. Land at Saskatoon infested with purslane was treated with pre-emergence applications of various herbicides on June 8 following shallow cultivation a few days previously. The herbicides and rates used were 2,4-D ester (butyl) and MCP ester (butyl) at 1/2 and 1 lb/A in 7.1 gal of water, DNOSBP (Dow Premerge) at 4 and 12 qt/A in 40 gal of water, TCA at 4 and 12 lb/A in 20 gal of water, and CMU at 1/2 and 2 lb/A in 50 gal of water. Applications were made to duplicated 4 rod-row plots (12 in. between rows). Reduction in stand of purslane of 50 to 75% resulted from the higher rates of 2,4-D, MCP and DNOSBP, while the lower rates of these herbicides gave 20 to 40% control. TCA and CMU had no appreciable effects. Vigor of surviving plants was apparently not reduced (ave. ht. 8 in.). All fluid measurements are in Imperial measure. (Contribution from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

Response of weed species to 2,4-D, MCP, and TCA. Dunham, R. S., A. H. Larson, H. G. Heggeness, and L. E. Anderson. 2,4-D and MCP amines were applied at 6 oz/A in 30 gallons of water to separate plots of each spp. at the 6-leaf stage. The following annual spp. were killed by both herbicides: Latuca spp., Ipomoea spp., Chenopodium hybridum, Chenopodium album, Dracocephalum parviflorum, Iva xanthifolia, Brassica juncea, Sisymbrium altissimum, Brassica kabe Erysimum cheiranthoides, Oenothera spp., Tribulus terrestris, Raphanus raphanistru Ambrosia artimesiifolia, Ambrosia trifida, Vicia spp., Conringia orientalis, Xanthium spp., Lepidium virginicum and Thaspi arvense. The following spp. were stunted by2,4-D only and a minimum of seed produced: Amaranthus retroflexus, Abutilon theophrasti, Helianthus annuus, Polygonum convolvulus, and Polygonum pennsylvanicum. Galeopsis tetrahit was killed by MCP but was resistant to 2,4-D. The following spp. were resistant to both herbicides: Cannabis sativa, Capsella bursa-pastoris, Malva rotundifolia, Galium spp., Silene noctiflora, Lychnis alba, Hibiscus trionum, Medicago lupulina, and Spergula arvensis. The following biennial spp. were resistant to both herbicides in their first year: Lappula spp., Arctium minus, and Verbascum thapsus. Trapogogon pratensis was killed by both herbicides. Daucus carota was killed by 2,4-D and injured by MCP.

TCA was applied to grassy spp. at 7 lbs/A in 30 gal of water at the 6-leaf stage. Echinochloa crusgalli, Setaria viridis, Setaria glauca, and Panicum capillare were killed. Bromus secalinus was resistant. (Contribution from the Divisions of Agronomy and Plant Genetics and Plant Pathology and Agricultural Botany, University of Minnesota, St. Paul, Minnesota. Paper No. 2924 Sci. Jour. Series, Minn. Agric. Exp. Station.)

Effects of pre-emergence applications of various herbicides on wild oats at early germination stage. Ebell, L. F. and W. G. Corns. On September 22, 1952, two days after seeding wild oats, soil applications of MH, IPC, CMU, IPC plus cyanamide were made at the following rates: MH and IPC - 2.5, 5, and 10 lb/A; CMU - 5, 10 and 20 lb/A. IPC and cyanamide combinations - 2.5, 5, 10 lb/A; and 100, 200 and 400 lb/A of IPC and cyanamide respectively. On September 29, one to two days before wild oat emergence, N-1 Napthyl Phthalamic acid was applied at 2.5, 5 and 10 lb/A. On October 16 and 17 data were taken using two 1/2 rod rows from each plot. Plants were in the 2-3 leaf stage. Plant count and green weight data for each of the various treatments were analyzed statistically. IPC and IPC plus cyanamide treatments resulted in considerable kill and stunting of plants. Plant count data indicated no significant kill from MH, CMU or Napthyl Phthalamic acid. Green weight data revealed a significant stunting effect from MH and CMU. Observations will be made on remaining plants until freeze-up. (Contributed by the Department of Plant Science, University of Alberta, Edmonton, Alberta.)

Fall application of TCA on wild oat infested soil. Ebell, L. F. and W. G. Corns. On September 21, 1952, two days after wild oats were sown, soil applications of TCA were made at the rates indicated in the table. Germination was good though growth was slow due to fall weather conditions. Check plants were in the 2-3 leaf stage on October 17, when two 1/2 rod row samples per plot were taken. Ave. plant counts and green weights for four replicates were as follows:

	5 lb/A	10 lb.	20 lb.	40 lb.	80 lb.	Check
Plant count	152.8	118.2	88.8	82.5	41.2	173.2
Green weight in grams	13.15	10.10	6.88	5.48	1.62	18.40

LSD at 5% - Plant count 64.4; Green weight 7.07

On both sets of data, the reduction in wild oat stand was significant at the 20, 40 and 80 lb. rates, and also at the 10 lb. rate for green weight data. Further differences probably would have resulted with time. The plots are of sufficient width to allow two seedings of crop to be made at different dates next spring and summer in order to test for possible residual effects of TCA. (Contributed by the Department of Plant Science, University of Alberta, Edmonton, Alberta.)

Effect of various herbicides on oats, barley and flax. Ebell, L. F. This experiment was conducted to obtain indications whether wild oats could be killed by chemicals without adverse effects on established and later emerging crop plants. Cultivated oats to simulate wild oats were sown the length of the experiment and allowed to emerge to the 2-leaf stage. Barley and flax were then sown at right angles and the chemicals applied two days later, on July 1. Weight of mature plant samples from a 4 sq. ft. area in each plot are reported below:

Treatments	Rate/A	OATS		BARLEY		FLAX	
		Rates	Chemicals	Rates	Chemicals	Rates	Chemicals
Sulphasan	3 qt.	101.0		34.0		24.7	
	6 qt.	68.0		46.7		24.7	
	12 qt.	42.0	70.3	48.7	43.1	31.3	26.9
PCP	2.5 lbs.	66.3		57.0		33.0	
	5 lbs.	29.3		59.7		40.0	
	10 lbs.	15.7	37.1	77.7	64.8	33.3	35.4
MH	1.7 lbs.	38.7		63.3		39.7	
	3.4 lbs.	3.0		64.7		27.0	
	6.8 lbs.	1.7	14.5	78.7	68.9	26.3	31.0
Dichloral Urea	2.5 lbs.	115.3		21.7		19.0	
	5 lbs.	131.3		27.3		20.0	
	10 lbs.	142.7	129.8	12.0	20.3	20.3	19.8
Check			73.6		34.8		28.2
LSO for Chemicals			23.0		15.5		-

PCP and MH almost completely eliminated the oats at the high rates and showed no damage to the barley and flax. Barley yield was significantly increased. Dichloral Urea, being toxic to germinating seeds, reduced the stand of barley and flax somewhat though not significantly. The oats seemed to derive some additional beneficial effect, tillered more freely and exhibited a deeper green. Some fertilizer effect may have occurred through foliage absorption of urea. Post-emergence treatment with dichloral urea and related chemicals may prove to be of great value in suppressing weed growth in established crops. (Contributed by the Department of Plant Science, University of Alberta, Edmonton.)

Differential effects of 2,4-D formulations sprayed on annual weeds. Hauser, Ellis W. Eight formulations of 2,4-D were sprayed on several annual weeds and observations of growth responses and percentage kill made. Oils with the properties described below were used singly or in blends as solvents in compounding the ester formulations: (1) aromatic content of 52.1% and distillation range of 430-552°F.; (2) aromatic content of 16.1% and distillation range of 363-583°F.; (3) aliphatic and moderately heavy. The ester concentrates were either the isopropyl or a mixture of the isopropyl and butyl. In addition, the dimethylamine salt was sprayed with and without 0.5% of added wetting agents. The weeds sprayed were Pennsylvania smartweed (Polygonum pennsylvanicum L.); lambsquarters (Chenopodium album L.); common ragweed (Ambrosia artemisiaefolia L.); giant ragweed (Ambrosia trifida L.); and sweet clover (Melilotus alba Desv.). Minor

differences among the ester formulations occurred but the effects were not consistent among species. The esters were somewhat superior to the unfortified amine. The addition of a wetting agent generally increased the effectiveness of the amine salt. The experiments indicated that an interaction existed between formulations and species. (Dept. of Botany, Iowa State College, Ames, Iowa.)

Evaluation of chemicals for pre-emergence treatments on giant foxtail (Setaria faberii). Heltsley, J. R. and F. W. Slife. The following chemicals were used at the indicated rates of active ingredient per acre for giant foxtail control. Dow Premerge 6, 9 and 12 lb/A, 3Cl IPC 6, 8 and 10 lb/A, TCA 3, 6, 9 and 12 lb/A, 2,4-D ester 1 and 2 lb/A, EHI at 4 and 6 lb/A, 4Cl IPC at 6, 8 and 10 lb/A, CMU at 1, 2 and 4 lb/A.

These chemicals were applied in water at the rate of 40 gal/A. Applications were made in a field of soybeans known to be thoroughly infested with giant foxtail. Chemicals were applied 2 days after planting soybeans to a moist, well-prepared seedbed.

The most effective chemical in this test was TCA. Even at 3 lb/A, TCA completely eliminated foxtail, but allowed broadleaved weeds such as pigweeds and smartweeds to emerge unharmed. Soybeans were severely injured at the lowest rate of TCA. EHI, 2,4-D, 4Cl IPC gave some reduction in foxtail stand but not satisfactory control. Dow Premerge gave excellent results at 12 lb/A but lighter rates were only partially effective. 3Cl IPC gave good results at 10 lb/A but not comparable to 12 lb. of DN or 3 lb. TCA. CMU at 4 lb/A completely eliminated foxtail but lighter rates were ineffective. After 2 years' tests of various chemicals applied as pre- and post-emergence sprays it appears that none of them can be used effectively in the corn and soybean fields of Illinois for giant foxtail control. (Contribution of the Illinois Agricultural Experiment Station, Urbana, Illinois.)

Post-emergent treatment for the control of green foxtail and wild oats in sugar beets. L'Arrivee, J. C. M. and E. T. Andersen. The plots consisted of 4 rows of sugar beets alternating with 2 rows of green foxtail (Setaria viridis) and 1 row of wild oats (Avena fatua). All other weeds were removed by hand cultivation. Precipitation was excessively high previous to, and the day following the treatments. The results of the treatments with the chemicals and combination of chemicals can be grouped as follows: 1. Good control of both green foxtail and wild oats was obtained with endothal (EC3740) at 8, 12 and 16 lb/A; combinations of endothal plus EH5722 at 4 & 2 and 4 & 4 lb/A; and by combinations of endothal plus IPC at 4 & 4 and 4 & 8 lbs/A. 2. Fair control of the green foxtail and excellent control of the wild oats was obtained with the combinations endothal plus CIPC at 4 & 2 and 4 & 4 lbs/A. 3. Good control of the green foxtail only was obtained with endothal at 4 lb/A; TCA, sodium salt, at 10 and 15 lb/A; and the combinations of endothal plus TCA at 2 & 5 and 4 & 5 lb/A. 4. Fair control of the wild oats only was obtained with the 8 lb/A application of CIPC. 5. Green foxtail and wild oats were unaffected by the 2 1/2 and 5 lb/A treatment of dichloral urea (EH2). The combinations of endothal plus N-1 naphthyl phthalamic acid (1-6Q8) at 4 & 2, 4 & 4 and 4 & 6 lb/A caused crinkling of the beet foliage; the highest rate causing stunting of the sugar beet. None of the other chemicals caused injury to the sugar beets. (Contribution of Division of Plant Science, The University of Manitoba, Winnipeg.)

Pre-emergent treatment for the control of green foxtail and wild oats in sugar beets. L'Arrivee, J. C. M. and E. T. Andersen. The plots consisted of 4 rows of sugar beets alternating with 2 rows of green foxtail (Setaria viridis) and 1 row of wild oats (Avena fatua). All other weeds were removed by hand cultivation. The herbicides used were: TCA sodium salt at 5, 10 and 15 lb/A; endothal (EC3740) at 2, 4, and 8 lb/A; IPC, CIPC, and EH3890 all at 4, 8 and 16 lb/A; dichloral urea (EH2) at 2, 3 1/2, 5 and 10 lb/A; CMU at 1/2, 1 and 2 lb/A xanthogen disulphide at 10, 20 and 30 lb/A; and a combination of 5 lbs. of TCA and 2 lbs. of endothal. The chemicals were applied in 40 gal. of water. In the order of effectiveness, the results indicated that green foxtail was controlled by TCA, endothal and EH3890. Wild oats was controlled only by IPC and CIPC. The only damage suffered by the sugar beets was caused by xanthogen disulphide at 20 and 30 lb/A. The remaining chemicals were ineffective at the rates used in this experiment. (Contribution of Division of Plant Science, The University of Manitoba, Winnipeg.)

Post-emergence application of Endothal in 1952 at 2 locations, one each in N. Dak. and Minn. to control wild oats in flax. Macdonald, W. P., C. C. Zinter and A. T. Slough. 3,6-endoxohexahydrophthalate (Endothal) was applied at 4, 2, 1 and 1/2 lbs. active ingredient per acre with four gallons of water at 2 locations as a selective post-emergence spray for wild oats control in flax. Wild oats 2 to 4 inches high, flax 1 to 3 inches. Plots were triplicated and randomized. All rates reduced wild oats stands at least 50% with delay in maturity and stand of flax and serious reduction in yield compared to checks. (Contribution of Agr. Dept., F. H. Peavey & Co., Minneapolis, Minn.)

Post-emergence application of CMU at two locations, one each in N. Dak. and Minn. to control wild oats in flax. MacDonald, W. P., C. C. Zinter and A. T. Slough. 3-P-Chlorophenyl - 1 - 1 - dimethylurea (CMU) was applied at 8, 4, 2 and 1 lb. active ingredient per acre with 35 gallons of water at two locations as a selective post-emergence spray for wild oats in flax. Wild oats 2 to 4 inches high; flax 1 to 3 inches. Plots were triplicated and randomized. The 4 and 8 lb. rates seriously reduced flax stand and maturity, while the 2 and 1 lb. rates delayed maturity and reduced yield only slightly. Better than 90% control of wild oats was obtained at the 8, 4 and 2 lb. rates, with 75% control at the 1 lb. rate. (Contribution of Agr. Dept., F. H. Peavey & Co., Minneapolis, Minn.)

Post-emergence treatments of wild buckwheat with various herbicides, 1952. Pavlychenko, T. K. and A. J. Bestrop. Wild buckwheat (Polygonum convolvulus) and grain wheat (Triticum vulgare) seed was mixed and sown in replicated plots for joint observations. When the weed had 2 - 4 leaves and the crop was 5 in. high, they were treated at 1 and 2 lb/A rates of ethyl, butoxy ethanol, and pentasyl esters, an amine salt, and 3 straight acid formulations of 2,4-D; amine salt of MCP; 3 mixtures of 2,4-D and 2,4,5-T and ester of 2,4,5-T and para; and at 10 and 20 lb/A rates of isopropyl-n-phenyl carbamate (IPC), isopropyl-n-(3-chlorophenyl) carbamate (CIPC), 3-p-chlorophenyl-1-1-dimethylurea (CMU), potassium cyanate (KCNO), and sodium trichloroacetate (NaTCA).

Results: The higher rates in all treatments were slightly more effective on wild buckwheat, but also more injurious to wheat. The esters and amine of 2,4-D reduced the stand, vigor and dry wt. of wild buckwheat by 94% (ACP649) to 100%. (Weedone LV4), with only slight depression of wheat. The acid formulations of 2,4-D and the mixtures of 2,4-D and 2,4,5-T gave good but less consistent control of wild buckwheat and were almost equally tolerant to wheat. The amine salt of MCP and the

ester of para were still more tolerant to wheat but also much less injurious to wild buckwheat. IPC was quite easy on both wild buckwheat and wheat. CIPC and CMU practically eliminated both weed and crop. Potassium cyanate and TCA stunted wild buckwheat badly but were also too severe on wheat, especially TCA. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

Pre-emergence treatments of more resistant annual weeds with different herbicides, 1952. Pavlychenko, T. K. Plots of Tartary buckwheat (Fagopyrum tartaricum), cow cockle (Saponaria vaccaria), hare's ear mustard (Conringia orientalis) and false flax (Camelina microcarpa) on clay loam soil were treated one day after planting with: 1, 2 and 3 lb/A rates of ethyl ester of 2,4-D (Weedone Concentrate), amine salt of MCP (Weedar MCP), acetanilide of 2,4-D (ACP646A), mixtures of esters of 2,4-D, 2,4,5-T and para (ACP912), mixture of acids of 2,4-D and 2,4,5-T (ACP926), micronized wettable acid of 2,4-D (ACP472); 2 and 4 lb/A of 3-p-chlorophenyl-1-1-dimethylurea (CMU); 6, 12 and 18 lb/A of isopropyl-n-(3-chlorophenyl) carbamate (CIPC) and 10, 15 and 20 lb/A of potassium cyanate (KCNO) and sodium salt of TCA. All chemicals were sprayed in 35 gal/A of water, except for ACP646A, applied in the same amount of Diesel oil. Growing conditions were favorable throughout the season.

Results: CIPC at the 3 rates used gave consistently a 100% kill to all the weeds treated. The remaining chemicals were extremely erratic in their reactions and not altogether consistent either in accordance with the rates used or the weeds treated. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

Pre-emergence treatments of wild oats, green foxtail and yellow foxtail with different herbicides, 1952. Pavlychenko, T. K. Replicated plots of wild oats (Avena fatua), green foxtail (Setaria viridis) and yellow foxtail (Setaria lutescens) were sown on the clay loam soil and treated one day later with: 1, 2 and 3 lb/A rates of ethyl ester of 2,4-D (Weedone Concentrate), amine salt of MCP (Weedar MCP), acetanilide of 2,4-D (ACP646A), mixture of esters of 2,4-D, 2,4,5-T and Para (ACP912), mixture of acids of 2,4-D and 2,4,5-T (ACP926), micronized wettable acid of 2,4-D (ACP472); with 2 and 4 lb/A rates of 3-p-chlorophenyl-1-1-dimethylurea (CMU); 6, 12 and 18 lb/A rates of isopropyl-n-(3-chlorophenyl) carbamate (CIPC); 10, 15 and 20 lb/A rates of sodium salt of TCA and potassium cyanate (KCNO). All chemicals were sprayed in 35 gal/A of water, except for ACP646A, which was sprayed in the same quantity of Diesel oil. Growing conditions were favorable throughout the season.

Results: Weedone Concentrate was agronomically ineffective on wild oats at all rates. At the 3 lb/A rate it reduced the dry wt. of green foxtail 32% and of yellow foxtail 26 and 34% at the 1 and 3 lb/A rates respectively. Weedar MCP was also insufficiently effective on wild oats and green foxtail but reduced the yellow foxtail by 58 and 62% at the 2 and 3 lb/A rates. ACP646A, 912, 926, 472, CMU and KCNO were considered agronomically ineffective on any of the three weeds at the rates used, although reductions up to 43% in dry wt. of green and yellow foxtails were recorded by some of these chemicals (CMU and ACP926). CIPC was very effective on the three weeds. It reduced wild oats by 32, 71 and 91%; foxtail by 53, 97 and 97%; and yellow foxtail by 86, 96 and 96% at the 6, 12 and 18 lb/A rates respectively. TCA eliminated green foxtail at all rates, reduced yellow foxtail by 79, 97 and 99% at the 10, 15 and 20 lb/A rates but gave only 13, 36 and 38% reductions in wild oats at the three rates used. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

Controlling tartary buckwheat with 2,4-D. Wood, H. E., H. A. Craig, and D. J. Hill. In Northern Manitoba trials undertaken in 1951 to control Tartary buckwheat, Fagopyrum tartaricum in cereal crops with 2,4-D butyl ester were repeated in 1952 on two farms. Application was made July 8 by knapsack sprayer to sq. rod plots of barley; in one field the barley 10" high, the buckwheat 3" to 6"; the other, barley 6", buckwheat 2 to 5". Three rates of chemical were used: 4, 8, and 16 oz. acid per acre.

Results: At 16 ounces, all top growth to tartary buckwheat was held in check, with the majority of plants killed; at the lower rates growth was retarded but only a small percentage of plants were killed. These results are comparable with those of 1951. From these trials and from observations made on several farms in the area where farmers have been spraying to control tartary buckwheat, indications point to an application of 6 to 8 ounces of ester of 2,4-D as giving a measure of control. (Contribution of the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada.)

Soil sterility of CMU, 1951-52. Burrows, V. D. and P. J. Olson. Four non-replicated 12 ft. x 12 ft. plots were treated with 0, 25, 50 and 100 lb. of active ingredient/A. Canadian thistle, red-root pigweed, perennial sow thistle and willow were killed by these treatments. The resulting barren soil was sown with 2 varieties of wheat and one variety of oats. After the plants reached a height of 4 in. they died off rapidly in the treated plots. Barley, scattered on the soil at harvest time, grew around the edges of the treated plots and in the check plot. It was apparent that CMU had sterilized the soil for the summer of 1951. In 1952, two more 12 ft. x 12 ft. plots were added to this experiment. They were treated with 5 and 15 lbs. of active ingredient/A. Single rows of wild mustard, wild oats, white-blossom sweet clover, Lee wheat, Dakota flax and O.A.C. 21 barley were sown in each plot including those treated in 1951 to determine the amount of sterility present. The regeneration of weeds was also noted. The plots treated with 50 and 100 lb. of active CMU (1951) and the 15 lb. rate (1952) did not permit any growth. A few sparsely spaced plants of barley appeared on the plot treated with 25 lb. The plot treated with 5 lb. produced a fair stand of barley and trace amounts of wheat and flax. Plants of Canadian thistle and willow were found growing on all plots but their stand and vigor were reduced by the 50 and 100 lb. rates. Sow thistle and barnyard grass were present on all plots except those treated with 50 and 100 lbs. No red-root pigweed plants were found on any plot. The experiment will be conducted again in the spring of 1953 to observe the degree of sterility remaining in the soil. (Contribution, Division of Plant Science, The University of Manitoba, Winnipeg.)

Pre-emergence control of crabgrass in crops. Elder, W. C. and Jack Dreessen. Several crops were used in a screenings test with a large number of chemicals. Of the chemicals used only four showed promise for pre-emergence control of crabgrass. These four chemicals were CIPC, CMU, DNOSBP, and N-1 napthyl phthalamic acid. In further tests, CIPC at 1, 2, 4, 6 lb/A; CMU at 1/6, 1/3, 2/3, 1 1/3 lbs/A; and DNOSBP at 1 2/3, 3 1/3, 5, 6 2/3 lbs/A were applied in 12-14 inch bands immediately after planting cotton, peanuts, and cowpeas. 1/6 lb/A of CMU, 1 2/3 lb/A of DNOSBP, and 1 lb/A of CIPC did not give satisfactory crabgrass control. All other treatments gave excellent control. Untreated plots showed a very heavy infestation of crabgrass. 5 lb/A and above of DNOSBP, and 2 lb/A and above of CIPC dwarfed young plants but did not reduce stand of cotton. 1/3 lb/A of CMU caused slight yellow discoloration of leaves while 2/3 and 1 1/3 lb/A caused considerable discoloration and the 1 1/3 lb. rate decreased cotton stand and yield. In those plots in which crabgrass control was effective and cotton stand was not reduced, yields were double those of the untreated plots in which no crabgrass control was practiced. The best rates for crabgrass control in cotton were observed to be 1/3 lb/A CMU, 2 lb/A CIPC, and 2 2/3 lb/A DNOSBP. On peanuts and cowpeas, considerable damage was noticeable in plots treated with CMU, and of the chemicals tested, CIPC looks the most promising for crabgrass control in these crops. (Contribution of the Agronomy Department, Oklahoma Experiment Station, Stillwater, Oklahoma.)

ANNUAL, WINTER ANNUAL AND BIENNIAL GRASSY AND BROAD-LEAVED WEEDS.

R. S. Dunham

The following classification is based on the selective use of the herbicide when applied post-emergence. Since tolerance of crops and lethal rates vary geographically, this classification is indicative rather than exact. It has been based on the reports of a maximum of 17 investigators for some spp. and a minimum of 2 for any spp.

REACTION OF ANNUAL WEEDS TO 2,4-D - POST EMERGENCE

Susceptible in Early and Late Vegetative Stages

Dragonhead mint *Dracocephalum parviflorum*
False flax *Camelina spp.*
Goose foot *Chenopodium spp.*
Henbit or dead nettle *Lamium amplexicaule*
Jewelweed *Impatiens pallida*
Lambsquarters *Chenopodium album*
Marsh elder *Iva xanthifolia*
Morning glory *Ipomoea hederacea*
Mustard, ball *Nesilia paniculata*
Mustard, Indian *Brassica juncea*
Mustard, tumbling *Sisymbrium altissimum*
Mustard, wild *Brassica kaber*
Mustard, wormseed or treacle *Erysimum cheiranthoides*
Plantains *Plantago spp.*
Puncture vine *Tribulus terrestris*
Radish, wild *Raphanus raphanistrum*
Ragweed, common *Ambrosia artemisiifolia*
Ragweed, giant *Ambrosia trifida*
Thistle, annual sow *Sonchus oleraceous*
Vetch, annual *Vicia sativa*
Winter-cress or bitter wormwood *Barbarea vulgaris*

Susceptible Only in Early Vegetative Stage

Batchelor's button *Centaurea cyanus*
Blue bur *Lappula echinata*
Cinquefoil, rough *Potentilla monspeliensis*
Cocklebur *Xanthium canadense*
Lettuce, wild *Latuca spp.*
Mustard, hare's ear *Conringia orientalis*
Mustard, tansy *Sophia spp.*
Peppergrass, wild *Lepidium virginicum*
Pineapple weed or wild marigold *Matricaria matricarioides*
Purslane *Portulaca oleracea*
Stinkweed *Thlaspi arvense*
Thistle, Russian *Salsola kali var. tenufolia*

Plants Not Easily Killed but Control of Seed Production Possible

Buckwheat, wild *Polygonum convolvulus*
Chickweed, common *Stellaria media*
Flixweed *Descurainia sophia*
Marestail or Canada fleabane *Erigeron canadensis*
Mayweed or dog fennel *Anthemis cotula*
Pigweed, rough *Amaranthus retroflexus*
Smartweeds *Polygonum spp.*
Speedwells *Veronica spp.*
Spurge, mat *Euphorbia glyptosperma*
Sunflower, wild *Helianthus annuus*
Velvet leaf or Indian mallow *Abutilon theophrasti*

Resistant

Barnyard grass *Echinochloa crusgalli*
Bedstraw *Galium aparine*
Bluegrass, annual *Poa annua*
Bromegrass, downy *Bromus tectorum*
Buffalo bur *Solanum rostratum*
Catchfly, night flowering *Silene noctiflora*
Cheat or Chess *Bromus secalinus*
Cockle, white *Lychnis alba*
Cockle, corn *Agrostemma githago*
Corn spurry *Spergula arvensis*
Cockle, cow *Sapponaria vaccaria*
Crab grasses *Digitaria spp.*
Cucumber, wild *Sicyos angulatus*
Flower of an hour *Hibiscus trionum*
Foxtails *Setaria viridis* and *S. glauca*
Goose grass *Eleusine indica*
Hemp *Cannabis sativa*
Hemp nettle *Galeopsis tetrahit*
Knotweed *Polygonum aviculare* and *P. erectum*
Mallow *Malva rotundifolia*
Medic, black *Medicago lupulina*
Nightshade, black *Solanum nigrum*
Oats, wild *Avena fatua*
Sandburs *Cenchrus spp.*
Shepherd's purse *Capsella bursa-pastoris*
Squirrel-tail grass *Hordeum jubatum*
Toadflax *Linaria vulgaris*

REACTION OF ANNUAL WEEDS TO 2,4-D. PRE-EMERGENCE

Susceptible:

Barnyard grass *Echinochloa crusgalli*
Crabgrasses *Digitaria spp.*
Goose grass *Eleusine indica*
Lambsquarters *Chenopodium album*
Mustard, tumbling *Sisymbrium altissimum*
Pigweed, Russian *Axyris amaranthoides*

Purslane Portulaca oleracea
Ragweed, giant Ambrosia trifida
Stinkweed Thlaspi arvense
Velvet leaf or Indian mallow Abutilon theophrasti

Resistant:

Chess Bromus japonicus
False flax Camelina spp.
Fleabane, Philadelphia Erigeron philadelphicus

REACTION OF ANNUAL WEEDS TO MCP - POST EMERGENCE

Susceptible in Early and Late Vegetative Stages

Dragonhead mint Dracocephalum parviflorum
Goosefoot Chenopodium spp.
Lambsquarters Chenopodium album
Marsh elder Iva xanthifolia
Morning glory Ipomoea hederacea
Mustard, Indian Brassica juncea
Mustard, tumbling Sisymbrium altissimum
Mustard, wild Brassica kaber
Mustard, wormseed Erysimum cheiranthoides
Puncture vine Tribulus terrestris
Radish, wild Raphanus raphanistrum
Ragweed, common Ambrosia artemisiifolia
Ragweed, giant or Kinghead Ambrosia trifida

Susceptible Only in Early Vegetative Stage

Cocklebur Xanthium canadense
Hemp nettle Galeopsis tetrahit
Lettuce, wild Latuca spp.
Mustard, hares-ear Coringia orientalis
Peppergrass, wild Lepidium virginicum
Purslane Portulaca oleracea
Stinkweed or Frenchweed Thlaspi arvense

Resistant:

Barnyard grass Echinochloa crusgalli
Bedstraw Galium aparine
Buckwheat, wild Polygonum convolvulus
Catchfly, night-flowering Silene noctiflora
Corn spurry Spergula arvensis
Crabgrass Digitaria spp.
Flower of an hour Hibiscus trionum
Foxtail, green and yellow Setaria spp.
Hemp Cannabis sativa
Mallow Malva rotundifolia
Medic, black Medicago lupulina
Pigweed, rough Amaranthus retroflexus
Shepherd's purse Capsella bursa-pastoris
Smartweeds Polygonum pennsylvanicum and persicaria

Sunflower, wild Helianthus annuus
Thistle, Russian Salsola kali var. tenufolia
Velvet leaf Abutilon theophrasti
White cockle Lychnis alba

PRE-EMERGENCE

Susceptible:

Crabgrasses Digitaria spp.
Lambsquarters Chenopodium album
Pigweeds Amaranthus spp.
Purslane Portulaca oleracea

Resistant:

Chess Bromus japonicus
False flax Camelina spp.

REACTION OF ANNUAL WEEDS TO TCA - POST-EMERGENCE

Susceptible:

Barnyard grass Echinochloa crusgalli
Bluegrass, annual Poa annua
Bromegrass, downy Bromus tectorum
Crabgrasses Digitaria spp.
Foxtails green & yellow Setaria viridis, glauca, and faberii
Goose grass Eleusine indica
Sandbur Cenchrus
Squirrel-tail grass Hordeum jubatum
Witch grass Panicum capillare

Resistant:

Chess or cheat Bromus secalinus
Purslane Portulaca oleracea

REACTION OF ANNUAL WEEDS TO TCA - PRE-EMERGENCE

Susceptible:

Barnyard grass Echinochloa crusgalli
Chess Bromus japonicus
Crabgrasses Digitaria spp.
False flax Camelina spp.
Foxtails, green & yellow Setaria viridis & S. glauca
Sunflower, wild Helianthus annuus
Wild oats Avena fatua

Resistant:

Flower-of-an-hour Hibiscus trionum
Lambsquarters Chencpodium album
Purslane Portulaca oleracea
Velvetweed Abutilon theophrasti

REACTION OF BIENNIAL WEEDS TO 2,4-D - POST-EMERGENCE

Susceptible Only in Early Vegetative Stage

Susceptible:

Carrot, wild Daucus carota
Evening primrose Oenothera biennis
Goatsbeard Tragopogon pratense
Parsnip, wild Pastinaca sativa

Resistant:

Burdock Arctium minus
Mullein Verbascum thapsus
Stickseed Lappula echinata

REACTION OF BIENNIAL WEEDS TO MCP - POST-EMERGENCE

Susceptible:

Evening primrose Oenothera biennis
Goatsbeard Tragopogon pratense

Plants Not Easily Killed But Control of Seed-Production Possible

Wild carrot Daucus carota

Resistant:

Burdock Arctium minus
Mullein Verbascum thapsus
Stickseed Lappula spp.

AQUATIC WEEDS

Summary

B. H. Grigsby

Only a single abstract was available, consequently no summary can be made.

Abstracts of Results of Cooperators

Control of water weeds with a wetting agent. B. H. Grigsby. A commercial wetting agent, sodium heptadecyl sulfate, was used to control weeds in aquarium tanks. The weeds killed were Lemna minor L., L. trisulea L., Spirodela palyrhiza, (L) Schleid., Anacharis canadensis (Mich) Planchon., Nasturtium officinale R. Br. and various species of filamentous green algae.

A range of dilutions from 1:1000 up to 1:20000 was used and lethal effects were found up to a dilution of 1:16000. All the listed aquatic plants except algae lost their green color and sank to the bottom of the tanks within 48 hours. The algae sank but remained green for periods up to 7 days. Goldfish in the treated water died within 24 hours, probably due to oxygen depletion. (Mich. Agri. Exp. Sta. and Div. of Weed Invest. BPIS&AE)

CONTROL OF WOODY PLANTS

Henry L. Hansen

Summary

Interest in brush control problems continued high during 1952. Evidence of this is the acceptance of well over forty abstracts for publication. These report on projects scattered over the entire region.

As would be expected from investigations covering such a great variety of species, climate, objectives of control, and other factors, the results are very difficult to analyze for the presence of any common pattern. For example, while as a general rule the low volume-high concentration treatments of phenoxy chemicals have been considerably less effective than the high volume-low concentrations, aerial applications using 5 gallons or less per acre of a concentrated solution have been surprisingly effective in some situations.

Interest in aerial spraying generated by the earlier success on mesquite in the southwest has spread to other areas. Good top kills and some inhibition of regrowth continue to be reported for mesquite using 2/3 lb. of 2,4,5-T ester in 4 gallons of oil or a 1:3 oil-water emulsion. Minnesota tests indicate that swamp alder sprayed by plane with as little as 1.14 lb. of 2,4-D-2,4,5-T mixtures in 1.14 gal. of fuel oil per acre has given a good top kill but that regrowth occurs the season after treatment. In Nebraska on the basis of first season results of aerial spraying 4 lb/acre were found to be much more effective than 2 lb/acre on large cottonwood and other flood plain tree species. Tests in Texas indicate the superiority of coarse droplets (400-600 microns) for aerial sprays.

Further testing of MCP has been reported during the past year. In general it has not been found to be as effective as 2,4,5-T. However, these tests have been only fragmentary and this chemical should not be discarded without further trial. An orthotoluidine salt of 2,4,5-T was reported as being very effective on barberry and may have value for testing on other species. TCA added to various phenoxy materials was reported as greatly increasing effectiveness on buckbrush and rose in Saskatchewan.

Foresters continue an active interest in trying to adapt chemical brush control to their special needs. Their relatively low per-acre economic limits have stimulated tests involving rather low rates of application of chemicals with temporary reduction in size and abundance of the brush rather than eradication as the objective Planted red and jack pine in Minnesota have been successfully released from aspen competition with little or no injury to the pine. In Illinois it was reported that brush hardwood areas could be treated successfully to prepare the area for the planting of conifers but that costs for the methods tried are prohibitive.

Interest in converting scrub aspen to more valuable forest types has resulted in several years of testing of chemical control measures on that species. From Michigan it has been reported that basal sprays of ester brush killers made on this species in the spring resulted in some suckering while similar treatment from the time of full leaf development in early June until October have resulted in no suckering over 3 seasons of trial. Other work from Michigan demonstrates that white pine is killed by several kinds of basal sprays indicating that conifers have no special tolerance to this type of treatment.

Information from Missouri, Oklahoma, Wisconsin, and Illinois gives some basis for comparing the relative effectiveness of basal sprays and application of chemicals in frills. As might be expected the frill applications are in general more effective

especially on larger trees and on species with thick bark. However, the less costly basal spraying seems equally effective in many cases on small sapling sized trees.

A resume of the work of the 1952 season further accentuates the need for the development of techniques of application or of chemicals which will do a more effective job of killing underground parts of woody plants so as to prevent regrowth. Fundamental research as to the life habits and the growth and regeneration characteristics of the brush species and the problems involved in the translocation processes are urgently needed. Further study of the possibilities of application of chemicals to the ground for intake through the root system may be helpful in obtaining more effective kill.

EFFECTS of season on suckering of scrub aspen treated with basal sprays. Arend, John L. During 1950, groups of 20 or more scrub aspen growing on a poor site in Northern lower Michigan were treated with a 50/50 mixture of 2,4-D and 2,4,5-T esters applied as a basal spray at various seasons of the year. The tests were first installed in February and then repeated weekly from May through October. The herbicide was applied at the rates of 8 and 16 pounds of acid per 100 gallons of diesel oil. The basal portion of each tree was thoroughly wetted to a height of two to three feet. At the end of the first growing season the tops of all treated aspen were dead with no apparent suckering. After the second growing season, aspen suckers were found among the trees treated between February and the time of full leaf development (June 9). However, no suckers were found among trees treated between June 9 and October. In the fall of 1952, three growing seasons after the basal treatment, the same condition existed -- no suckering among the scrub aspen trees treated after full leaf development through October. Lake States Forest Experiment Station, East Lansing, Michigan.

OIL versus water carriers with 2,4,5-T applied to frill girdles. Arend, John L. Applying 4 pounds of 2,4,5-T ester per 100 gallons of oil to frill girdles has been found to be more effective in controlling scrub oak, aspen, and red maple in northern lower Michigan than 8 to 40 pounds of acid per 100 gallons of water. Although approximately 50 percent of the trees treated with the low concentration of 2,4,5-T ester in the diesel oil carrier sprouted, the sprouts were less numerous and vigorous than those developing from trees treated with the water carrier. Diesel oil, in addition to being an effective herbicide with 4 pounds of 2,4,5-T ester per 100 gallons when applied to frill girdles on scrub oak, aspen, and red maple, is also easier to handle than a water carrier during subfreezing weather. Lake States Forest Experiment Station, East Lansing, Michigan.

Response of post and blackjack oaks to aerial spray applications of 2,4,5-T and 2,4-D. Darrow, R. A. and W. G. McCully. Sixteen 5-acre plots of post and blackjack oak woodland 12 to 35 ft. in height were sprayed near College Station, Texas, on May 24-25, 1951, at 4 and 8 gal/A with the following herbicides: propylene glycol butyl ether (PGBE) ester of 2,4,5-T at 2,3 and 4 lb/A in diesel oil and 1:3 oil/water emulsion; 2,4,5-T amine at 2 and 3 lb/A in 1:3 oil/water emulsion; PGBE esters of 2,4-D and 2,4,5-T at 2 lb/A in diesel oil and 1:3 oil/water emulsion; and 2,4-D PGBE ester at 3 lb/A in diesel and 1:3 oil/water emulsion. Treatments were applied prior to and following light rain; subsequent moisture conditions for growth have been unfavorable because of prolonged drought. Top-kill observed in July, 1952, on trees 6-20 ft. in Height was 83-87% for post oak and 40-59% for blackjack oak from applications at 4 gal/A of 2 lb/A of 2,4,5-T ester in diesel oil or the combination of 2,4,5-T and 2,4-D esters in emulsion; top-kill on plants less than 6 ft. in height was less effective. Higher rates of application of 2,4,5-T ester gave less effective top-kill, but were superior in effectiveness to the results obtained with 2,4,5-T amine and 2,4-D ester. A comparable series of treatments applied in August, 1951, on woodland 20-35 ft. in height gave little or no plant kill.

Comparison of single and repeated spray applications was made in a mixed oak stand 6-15 ft. in height. Portions of 5-acre plots sprayed on June 10, 1950, at 4 gal/A with 2,4,5-T PGBE ester at 1 and 1.5 lb/A, butoxy ethanol esters of 2,4-D and 2,4,5-T at 1.5 lb/A and 2,4,5-T amine at 0.75 and 1.5 lb/A in 1:3 oil/water emulsions were each retreated on May 25, 1951, with 0.75 and 1.5 lb/A of 2,4,5-T PGBE ester at 4 gal/A in emulsion. Top-kill of post and blackjack oaks was 90% or more on plots receiving a total of 2.5-3 lb/A of 2,4,5-T ester or combination of 2,4-D and 2,4,5-T esters in repeated applications. Single applications of 1 lb/A of 2,4,5-T ester made in 1950 gave 36-57% plant kill in observations made July, 1952. (Contribution of Department of Range and Forestry, Texas Agricultural Experiment Station, College Station, Texas).

The effect of basal stem sprays on white pine. Day, Maurice W. Trees of white pine (Pinus strobus) 2 to 8 inches in diameter were given a basal stem spray on July 7, 1952. The spray was applied to the basal 18 inches to the point of run-off. Chemicals used were:

(1). 2,4,5-T propylene glycol butyl ether ester
(2). 2,4-D isopropyl ester
(3). 2,4-D alkanolamine.

The solutions were all in diesel oil. The results were judged on October 14, 1952. Only those trees having all the needles brown were considered as dead. The author is reasonably certain that the trees listed as dying will be dead before the next growing season. No effects of the spraying were noticeable until about 3 weeks after the treatment. The results obtained were as follows:

Chemical #	Concentration	Number of trees			
		dead	dying	healthy	total
1	8 lb ahg	6	10	1	17
1	12 lb ahg	4	5	0	9
1	16 lb ahg	5	5	0	10
2	8 lb ahg	1	9	0	10
2	12 lb ahg	5	4	0	9
2	16 lb ahg	6	4	0	10
3	12 lb ahg	1	0	7	8

(Contribution of Michigan Agricultural Experiment Station - Dunbar Forest Experiment Station.)

A frill girdle treatment for aspen. Day, Maurice W. Fifty aspen (Populus tremuloides) trees 4 to 8 inches in diameter were treated with a solution of Dow Defoliant (sodium monochloroacetate) consisting of 2 lbs. to 1 gal. of water. The solution was poured into a frill girdle made with an axe completely around the tree trunk. The treatment resulted in the death of all but 2 of the trees treated. The leaves were killed much more quickly than those on trees treated with basal sprays of 2,4-D or 2,4,5-T. Treatments were made from late June to August 11th with equal effectiveness. (Contribution of Michigan Agricultural Experiment Station - Dunbar Forest Experiment Station.)

Foliage spray of 2,4,5-T and 2,4-D on oak. Elder, W. C. and Jack Dreessen. In June, and in August of 1951 foliage applications of 2,4,5-T and 2,4-D were made on post oak (Quercus stellata) and blackjack oak (Quercus marilandica) with an orchard type airblast sprayer. Results were read July, 1952. Rates of applications varied from 1 lb/A to 8 lb/A of ester and amine forms of 2,4,5-T and from 2 lb/A to 24 lb/A of ester, sodium salt, and ammonium salt forms of 2,4-D. Also, mixtures of 2,4,5-T and 2,4-D at 3 lb/A were applied. Carriers used in these tests were oil, water, and oil-water emulsions at rates from 5 gal/A to 40 gal/A. Constant pressure was maintained on all plots sprayed. June treatments indicated much better kill than did August treatments. Generally 2,4,5-T or mixtures of 2,4,5-T and 2,4-D gave better kill than did 2,4-D alone. Little evidence was found to indicate any advantage of one carrier over the other. The 2 lb/A and 3 lb/A rates of application of 2,4,5-T and the 3 lb/A mixtures gave as good a kill as did the higher rates regardless of the carrier used or quantity applied. Some of the plots showed no resprouting one year after treating, but most of the areas were resprouting at base of tree and new growth appeared on the large branches of the trees. Foliage application was also made in October using approximately the same materials and rates of application, but results were not as good as those obtained from the June treatments. (Contribution of the Agronomy Department, Oklahoma Experiment Station, Stillwater, Oklahoma).

Effect of 2,4-D and 2,4,5-T on persimmons. Elder, W. C. and Jack Dreessen. Basal, frill, and stump treatments on persimmons (Diospyros virginiana) have been applied at monthly intervals from 1949 to 1952. Ester formulations of 2,4-D and 2,4,5-T and mixtures of the two have been applied in diesel fuel and kerosene, and a wide range of concentrations and quantities have been used. Persimmon has a reputation as an outstanding plant for resprouting and none of the treatments have given complete eradication. Light dosages in concentrations sufficient to obtain top kill allow heavy resprouting the first year. Heavier applications may suppress sprouts for a period of one year. If sprouts are suppressed for one year, they usually appear several feet away from the trunk of the tree, on the extensive root system that this plant possesses. Although some plots show good kill when 2,4-D is used, 2,4,5-T is more consistent and gives a more permanent kill and should be recommended for persimmon control. Results vary according to the time of year when treated. In some months all of the concentrations and quantities used had effect on the basal treatments while in other months only extremely high concentrations and large quantities showed any effect. It is difficult to draw conclusions as to the proper months for applying chemicals, but it was noticeable that best results were obtained during the growing seasons when good moisture conditions were prevalent. Treatment in June, July, and August of 1950, during a season of high rainfall gave the best results, while the same treatments made in the same months in 1949 and 1951 under dry conditions were complete failures. Frill treatments in fall months of 1949 not only gave complete top kill, but gave complete sprout control until June of 1951 when lateral sprouts appeared. Foliage applications of 2,4-D and 2,4,5-T on persimmons cause quick leaf drop, usually with little effect on the plants. (Contribution of the Agronomy Department, Oklahoma Experiment Station, Stillwater, Oklahoma).

Effect of 2,4-D and 2,4,5-T on oak species. Elder, W. C. and Jack Dreessen. Ester formulations of 2,4-D and 2,4,5-T, and mixtures of the two have been applied in diesel oil and kerosene as basal, frill, and stump sprays on Blackjack oak (Quercus marilandica) and Post oak (Quercus stellata) at monthly intervals from 1949 to 1952. Results are given here for only the 1949 to 1951 work. Trees under 4 inches diameter were basal treated; trees over 4 inches were frill treated, and trees of all sizes were stump treated. A wide range of concentrations and quantities was applied to the oak. In these tests more consistent results were obtained with the use of 2,4,5-T than with 2,4-D at equal concentrations. More top kill was obtained from frill treatments than from basal treatments. By using heavy concentrations and high quantities, it is possible to get complete top kill with little resprouting. Where lesser concentrations and volumes are used, top kill is obtained, but resprouting is evident. Sprout control in stump areas is in direct proportion to the amount of material used. It is possible to eliminate sprouts by using large quantities of 2,4,5-T. In all the methods, resprouts are found not only at the crowns, but may appear as lateral sprouts 4 to 5 feet from the trees. Post oak has been found to be more susceptible to treatments than blackjack. Basal and frill applications made in the months of November, December, February, and March appear to give the best results. Practical application of the results obtained in these tests are that these methods can be used on small areas to prevent spreading, or for fence rows, high lines, etc., where cost is not an item. These methods are very expensive and often cannot be considered on large range land areas. (Contribution of the Agronomy Department, Oklahoma Experiment Station, Stillwater, Oklahoma.)

Control of elm by herbicide injection. Gleason, L. S. Undiluted commercial formulations of an isopropyl amine salt of 2,4-D, 2,4,5-T propylene glycol butyl ether ester, 2,4,5-T amine, MCP amine and MCP ester were injected into basal notches on Ulmus Americana and Ulmus fulva trees averaging 6 inches in d.b.h. Injections of 1 ml concentrate per 6 inches of circumference were made in the fall, winter, spring, and summer. The best results, 90% of the trees killed, were obtained with the 2,4-D amine. Late fall and winter applications appeared more effective than spring and summer treatments. (Contributions of the Department of Botany, Iowa State College.)

Control of buckthorn by basal sprays. Gleason, L. S. Trunk base applications of a 50% mixture of the propylene glycol butyl ether ester of 2,4,5-T and the propylene glycol butyl ether ester of 2,4-D were made on buckthorn (Rhamnus carthartica) in spring and early summer. Concentrations of 0.5, 1 and 2% were applied at a rate of 12 ml/inch of circumference, and concentrations of 2, 4, and 8% were applied at a rate of 3 ml/inch of circumference. Top kills of 100% were obtained in all applications. (Contribution of the Department of Botany, Iowa State College.)

Eliminating cull trees with 2,4,5-T. Jokela, J. J. and Ralph W. Lorenz. Cull trees accounting for 11 per cent of the residual basal area following a harvest cut made in a Fayette county woodland were treated February, 1952, with kerosene containing 16 lb ahg of 2,4,5-T acid equivalent as the propylene glycol butyl ether ester (Esteron 245). A total of 522 trees was treated by one of three methods (1) basal spray, (2) ax frill with spray, (3) Cornell tool. The basal spray thoroughly wetted the base of tree stems to a height of 1.5 ft. In the 2nd method a spray was directed in an ax frill cut through the bark completely around the base of the tree. Both the ax frill and Cornell tool were applied at a height above the ground equal to approximately the diameter of the tree. The effectiveness of the treatments were evaluated on a degree of injury scale ranging from 0 to 10. No apparent top injury equalled 0; complete top killing 10. The averages appearing below are based on observations made September 18, 1952.

Hickory		Post, white oak		Black jack, black, red oak		Elm		Ash		Walnut		Others*	
No.	Av.	No.	Av.	No.	Av.	No.	Av.	No.	Av.	No.	Av.	No.	Av.
Basal spray on trees 3-10 in, in diam. (23 ml. solution/in. circum. bh.)													
65	9.1	26	10.0	32	10.0	1	4.0	-	-	2	10.0	2	10.0
Ax frill and spray on trees 5-20 in. in diam. (10 ml. solution/in. circum. bh.)													
19	3.4	12	10.0	91	10.0	8	8.9	1	6.0	-	-	2	10.0
Cornell tool on trees 3-20 in. in diam. (1.5 ml. solution/in. circum. bh.)													
102	1.5	24	8.7	103	8.0	8	4.5	5	2.2	11	1.1	9	9.6

*Mulberry, honey locust, hackberry, silver maple, sassafras and box elder.

No apparent relation existed between the effect of any one treatment and tree size. The percent of trees sprouting by treatments were as follows: basal spray 0; ax frill with spray 5; and Cornell tool 7. (Illinois Agricultural Experiment Station.)

Chemical eradication of scrub oak. Kuntz, J. E. and A. J. Riker. The effectiveness was tested of various chemical herbicides in eradicating northern pin oaks (Quercus ellipsoidalis, 4-6 inches dbh) (1) from mixed oak-pine stands and (2) from the margin of oak wilt areas to prevent the fungus spreading through root grafts. Replicated woodland plots were on Plainfield sand in central Wisconsin. Herbicides were applied (1) to holes spaced every 4 inches around the root collar, (2) to discontinuous frill around the trunk, (3) to bark of the lower trunk, and (4) to the ground within 3 feet of the tree. The amounts used, respectively, for spray treatments were 20, 60, 120, and 240 ml per tree. Tests were made in March (dormant, snow, ground frozen), April (dormant, partly thawed), May (budbreak), June (½ leaf) and July and August (full leaf), 1952. Both fungi and insects invaded the severely injured trees, regardless of poison used. First season results are reported.

A. Sodium arsenite (61%, only treatment No. 1). Arsenite applied in holes during March and April gave poor kill with limited distribution of the poison within the tree and with no translocation to adjacent trees. Trunk suckering and basal sprouting were common. Later treatments, however, gave excellent and rapid kill, extensive distribution of the poison, and frequent root-graft translocations to adjacent oaks (up to 25 ft). (Translocations commonly followed arsenite applications to holes in each buttress root or to holes spaced every 2 inches in the root collar, especially if the treated tree was girdled.) Streaks of live trunk tissue occasionally remained. Sprouting and suckering occurred infrequently. The bark loosened rapidly.

B. Ammate (dry crystals; treatments No. 1, 2, and to "cups" spaced every 6 inches around the trunk at 18 inches). Early response to ammate was slower and more variable than that to arsenite. Frills gave the best and most consistent kill at all dates; cups and least, especially in March and April treatments. Frills, however, resulted in the most basal sprouting--especially in early treatments--and no translocation to adjacent trees; holes gave less sprouting and occasional translocations. Streaks of live trunk tissue often remained.

C. CMU (1.6 lb/gal water suspension; all treatments): toxicity from CMU was slow (most trees reached full leaf) but severe, regardless of date of applications. Injuries from treatments in March and April did not appear earlier than those in May, Vascular wounding did not hasten or increase injury. In all treatments, grass, weeds, and shrubs subject to CMU washed from the trunk were killed in a few weeks. Most oaks within 25 feet of the treated tree showed severe injury, especially near basal and ground treatments, and often sooner than the treated tree. Adjacent jack and red pine, however, showed little or no injury unless close to the treated tree. The inner bark of many trees, ground-treated in March, April, and May, had turned brown by September. Basal sprouts occurred only in the frill treatment and many had died by October.

D. Phenoxy herbicides: 2,4,5-T, 2,4-D, and 2,4,5-T + 2,4-D, (all as propylene glycol butyl ether esters) and MCP (butoxy ethanol ester) (16 lb/100 gal fuel oil; treatments 1, 2, and 3). No significant differences in gross injury were observed among the 3 substances. Applications in March, April, and May caused greatest injury. Injury was most severe to both foliage and inner bark in frill applications; somewhat less with basal, and not only slight but variable with holes. Little basal sprouting occurred. Large vertical trunk cracks, often 8-12 ft long and due to a marked proliferation of the inner bark, commonly followed late season applications of 2,4,5-T and MCP--especially in holes. Many such trees showed little or no foliage injury.

E. Others: Ground treatments using TCA (20 lb/A) and endothal (10 lb/A) caused little or no injury to treated oaks. TCA caused severe injury on grass in treated areas. Practically all oaks frilled without the application of poison maintained full, green crowns even though only 1 or 2 streaks of live bark remained between frills. (Contribution of the Wisconsin Agricultural Experiment Station in cooperation with the Wisconsin Conservation Department and the Nekoosa-Edwards Paper Company.)

Chemical weed control in forest firelanes. Kuntz, J. E., A. J. Riker, and R. C. Dosen. Weed growth greatly reduces the effectiveness of forest firelanes located on the highly leached, rapidly drying, infertile Plainfield sand of central Wisconsin. Firelane weeds include quack and annual grasses, sedges, and many common broadleaved weeds. Investigations since 1948 have indicated promise with herbicides. By midsummer, regrowth of weeds in both treated and untreated plots was more abundant on firelanes rototilled the previous August than on nonrotatilled lanes. Herbicides were applied in April. Weed populations changed markedly following treatment with different herbicides; e.g., flowering spurge followed CMU, peppergrass followed borax, chickweed followed TCA, etc.

A. Borax. Replicated firelane plots treated in the spring of 1950 with borascu (10 and 20 lb/sq rd. dry) had moderate to heavy regrowth by 1952, but those retreated in 1951 had only sparce regrowth in 1952. Plots treated in 1951 with 20 lb borascu had little or no regrowth in 1952; those retreated in 1952 were bare. Plots treated in 1951 with only 10 lb borascu had moderate to heavy regrowth in 1952; those retreated in 1952 had little regrowth in 1952. Plots treated in 1952 with 10 lb borascu were practically bare by fall.

B. CMU. Plots treated in 1951 with CMU (20 and 40 lb/A, suspension) remained bare through 1952 except for a sparce regrowth of flowering spurge which died by midsummer. CMU plots retreated in 1952 also remained bare. Plots treated in 1952 with CMU (5, 10, and 20 lb/A) were bare by midsummer. Again, response to CMU was slow, especially to 5 and 10 lb/A rates, and flowering spurge survived to midsummer.

Firelanes sprayed in May, June, and July, 1952, with a power-driven, boom-sprayer using CMU (10 and 20 lb/100 gal water/A) were all bare by fall.

C. TCA. Plots treated in 1951 with TCA (50 lb/A) had heavy regrowth in 1952 and even plots retreated in 1952 had moderate regrowth by fall. 1952 applications of TCA at 20 and 40 lb/A gave good initial control of grass and most broadleaves--especially on nonrototilled firelanes--but moderate to heavy regrowth by late summer. TCA at 10 lb/A did not control weeds. The addition of 2,4-D (4 lb/A, isopropyl ester) gave better control than TCA alone of both grass and broadleaves. This mixture applied to firelanes with a power sprayer gave comparable results.

D. CIPC. Plots treated in 1952 with CIPC at 5, 10, and 20 lb/A had most grass apparently killed at the higher concentrations, but little injury to most broadleaves. The addition of 2,4-D (4 lb/A, isopropyl ester) gave good initial control of both grass and broadleaves.

E. Endothal. Endothal (5, 10, and 20 lb/A) gave little or no weed control. (Contribution of the Wisconsin Agricultural Experiment Station in cooperation with the Wisconsin Conservation Department and the Nekoosa-Edwards Paper Company.)

Chemical control of weed competition in forest plantations. Kuntz, J.E. and A. J. Riker. The survival and growth of young forest plantations are severely reduced by weed competition, especially by grass, during the first few years. Weed control by cultivation often has critical limitations. Investigations since 1948 have indicated promise with chemical herbicides. Replicated plantings were made in early May, 1952, on alkaline muck and silt loam in southern Wisconsin and on Plainfield sand in central Wisconsin. The loam and muck areas were plowed and disked just prior to planting. Both dormant cottonwood cuttings and jack and red pine transplants were used. Herbicides were applied immediately after planting either to the entire plot or to a limited area around trees that were protected.

A. Sand. Both borascu at 10 lb/sq rd, dry and CMU at 5, 10, and 20 lb/A, water suspension, gave excellent weed control, but killed both pine and poplar. Plots treated in 1951 with CMU at 20 and 40 lb/A and replanted in 1952 remained bare throughout 1952, and all trees again were killed. TCA at 20 and 40 lb/A gave good initial control of grass and most broadleaves, but even 10 lb/A killed all pine and caused chlorosis, stunting, and defoliation of poplar, varying somewhat with concentration. CIPC at 10 and 20 lb controlled most grasses with little or no injury to trees. Endothal at 5, 10, and 20 lb/A had little effect on either weeds or trees. The response of poplars to weed control on sand varied from no survival in unweeded plots to 100% survival and 18 inches growth in cultivated or chemically weeded plots. Pines survived weed competition.

B. Loam. CMU at 5, 10, and 20 lb/A controlled all weeds, except quack grass, which remained very sparse and stunted. All trees were killed by midsummer. TCA at 20 and 40 lb/A controlled all grass, including quack grass, and most broadleaves. TCA at 10 lb/A controlled most grass, except quack which remained very sparse and stunted, and reduced the stand of broadleaves. 2,4-D at 4 lb/A, isopropyl ester and TCA at 20 lb/A controlled all weeds. Pines were killed at the higher concentrations and severely injured at 10 lb/A of TCA. Poplars were stunted (1-2 ft) and partially defoliated at all concentrations.

CIPC at 10 and 20 lb/A controlled most grass, except quack grass, which remained sparse and stunted, and reduced the stand of broadleaves. CIPC at 5 lb/A gave much less control. There was no apparent injury to trees.

On areas free of quack grass, endothal at 10 and 20 lb/A controlled both grass and weeds with no injury to trees (poplars 3 ft). Endothal had little effect on quack grass. The response of poplars to weed control on loam varied from poor survival and poor growth (1 ft or less) in unweeded plots to 100% survival and 3 ft of growth in weeded plots. Pines survived weed competition. Three year old cottonwoods, sprayed in June, 1952, with 2,4-D (4 lb, isopropyl ester) mixed with CMU (10 lb/A) or CIPC (10 lb/A) or TCA (20 lb/A) or endothal (10 lb/A) gave good weed control and little permanent injury to trees.

C. Muck. CMU at 5, 10, and 20 lb/A controlled all weeds. At 5 lb/A, poplars showed no injury (100% survival; 4 ft) and pine were slightly off-color. At 10 lb/A, poplars were stunted (2 ft and 100% survival) and pine were stunted and chlorotic. At 20 lb/A, poplars eventually died and the few remaining pine were severely stunted and chlorotic. Unprotected trees responded similarly. TCA at 10, 20, and 40 lb/A controlled all grass and injured broadleaves at the higher concentrations. The addition of 2,4-D (4 lb/A, isopropyl ester) controlled all weeds. Poplars were stunted (2 ft) and partially defoliated at all concentrations of TCA. Pines were severely stunted and showed severe necrosis and defoliation of lower needles. CIPC at 5, 10, and 20 lb/A controlled grass at the higher concentrations and showed no injury to poplars (100% stand; 3-4 ft) or pine. The addition of 2,4-D (4 lb/A) gave somewhat better weed control and no injury to trees. Endothal at 5, 10, and 20 lb/A caused only slight, temporary injury to weeds at the higher concentrations and no injury to trees. The response of poplars to weed control on much varied from poor survival (30%) and poor growth (1 ft or less) in unweeded plots to 100% survival and 3-4 ft of growth in weeded plots. Pines survived weed competition. (Contribution of the Wisconsin Agricultural Experiment Station in cooperation with the Wisconsin Conservation Department and the Nekoosa Edwards Paper Company.)

Controlling woody plant growth on forest planting sites in Illinois by the use of a 2,4-D and 2,4,5-T stump spray. Lorenz, Ralph W. and J. J. Jokela. Approximately 3 million A of potential forest planting sites in Illinois contain some advanced hardwood growth which presents a serious problem in the establishment of coniferous plantations. A one-fifth A circular plot was laid out July 20, 1950 on a "brushy" planting site in Hancock county. The plot contained 107 shrubs and hardwood trees ranging from 4 to 30 ft high with an average height of 10 feet. Species were present as follows: elm 35; Crataegus 31; hickory 11; black cherry 5; dogwood 5; shingle oak 4; honey locust 3; black walnut 3; red oak 2; white oak 2; bur oak 1; black oak 1; Osage orange 1; prickly ash 1; and hoptreel. All woody vegetation was cut and the brush put in piles. The stumps were then sprayed with kerosene containing 5 lb ahg each of the isopropyl ester of 2,4-D and 2,4,5-T (Brush Off No. 430). The entire treatment required 8 man-hours of labor and 5 1/8 gallons of oil solution. By September 1951, 17 stumps (19 per cent) contained either sprouts or root suckers. Sprouting from the above-ground portions of the treated stumps was almost competely lacking. Regrowth was mostly in the form of root suckers from the Crataegus; some at considerable distance from the stump. This plot was exceptionally clean and free of woody vegetation during 1951 and 1952. Nevertheless, the use of 29 gal of solution and 5 man-days of labor per A makes the cost of this method prohibitive for general use. (Illinois Agricultural Experiment Station.)

Effect of ortho-toluidine salt of 2,4,5-T on European barberry. Melander, L. W., and Campbell, Mac A. On July 9, 1951, 15 European barberry bushes (Berberis vulgaris) were treated by lightly spraying the entire bush and heavily spraying the stems at the groundline with a 1- per cent emulsion by weight of orthotoluidine salt of 2,4,5,-T. This chemical had been solubilized with a liquid detergent and diluted with water. On July 9, 1952, all but one bush were dead and that one appeared to be dying.

On September 29, 1951, eight more bushes were treated by merely spraying the foliage. On June 6, 1952, all of these bushes were still alive, but all were dead on July 9, 1952. These results would indicate that ortho-toluidine salt of 2,4,5-T has herbicidal possibilities for killing other woody plants. The fact that it took 9 months to kill the eight bushes indicates that this chemical has a sustaining herbicidal effect. Since ortho-toluidine is an aniline derivative, its possible poisonous qualities should be considered when used in further experimentation. (Contribution of Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, U.S.D.A.)

Basal bark and frill treatment of pole-size post oak and hickory. Nichols, J. M. Summer applications were made in Aug., 1950, and winter treatments were made in Feb., 1951. The following tables shows the percentage of trees which were stem-killed and had not produced sprouts from the roots by Sept., 1952.

Treatment	Post Oak		Hickory	
	Summer	Winter	Summer	Winter
Ammate (4lb/gal water) frill	40	70	50	30
2,4,5-T (20 lb ahg kerosene) frill	80	80	100	90
2,4,5-T (20 lb ahg kerosene) basal	0	80	30	70
2,4,5-T (40 lb ahg kerosene) basal	0	50	100	90

(Contributed by Department of Forestry, University of Missouri).

Effectiveness of several stump treatments after one, two, and three growing seasons. Nichols, J. M. It has been noted that first year results do not give the true effects of chemical applications. The following tabulation gives the percentage effectiveness of March, 1949, treatments after each of the three succeeding growing seasons.

Treatment	Persimmon			Sassafras			Hickory		
	1949	1950	1951	1949	1950	1951	1949	1950	1951
2,4,5-T (17 lb ahg kerosene)	100	100	80	100	80	70	90	50	20
2,4,5-T (3.9 lb ahg kerosene)	100	90	70	90	60	50	70	30	20
2,4,5-T (17 lb ahg water)	70	30	30	50	20	10	90	50	30
Ammate (4 lb/gal water)	80	80	40	80	60	50	80	40	30
Ammate (1 lb/gal water)	30	20	20	20	10	10	20	10	10
Ammate (1 tablespoon/ stump)	10	10	10	60	30	10	40	10	20

(Contributed by Department of Forestry, University of Missouri).

Use of 2,4,5-T and ammate in applications made each month during 1950. Nichols, J. M. 2,4,5-T was used at a concentration of 17 lb ahg of kerosene and ammate at a concentration of 4 lb/gal water in stump applications. 2,4,5-T was also used on some species as a basal spray. Effectiveness of each treatment is given in the following table - percentage of stumps of persimmon, hickory and sassafras without sprouts in Sept., 1952, and percentage reduction in basal area over check for oak and hickory sprouts.

Month	Persimmon (2-4 in.diam.)		Hickory (2-4 in.diam.)		Sassafras (under 2 in. diam.)			Mixed Oak Hickory (under 3 in. diam.)		
	2,4,5-T stump	ammate stump	2,4,5-T stump	ammate stump	2,4,5-T stump	2,4,5-T basal	ammate stump	2,4,5-T stump	2,4,5-T basal	ammate stump
Jan.	80	10	90	10	40	20	20	32	33	65
Feb.	90	30	90	45	40	10	50	31	58	61
Mar.	60	20	100	60	20	50	20	33	48	0
Apr.	80	40	90	90	40	20	30	13	0	43
May	80	40	90	65	70	70	60	45	84	41
June	100	50	90	40	50	60	70	0	30	59
July	100	10	80	70	90	40	40	43	30	0
Aug.	100	40	100	65	80	40	20	50	61	0
Sept.	100	10	80	50	80	50	60	12	44	0
Oct.	90	10	75	20	100	20	20	79	64	0
Nov.	100	30	90	45	60	50	20	15	32	57
Dec.	100	20	100	10	80	50	10	68	76	48

(Contributed by Department of Forestry, University of Missouri)

Herbicides, type of solution, treatment, and volume of solution, on hawthorn. Owens, Clarence, and Willard, C. J. Treatments of hawthorn (Crataegus sp.) were made from February through July by dormant basal, spring basal, and growing season foliage applications. Hawthorn stumps were also treated during the dormant season. Basal dormant and basal spring treatments were made with No. 2 diesel oil solutions containing 2, 4, 8, 16, 32, and 48 lb. ahg of the polypropylene glycol butyl ether esters of 2,4-D (Esteron Ten-Ten), 2,4,5-T (Esteron 245), and 50-50 mixture of the two (Esteron Brush Killer). The solutions were applied to the trunk from the ground level up 2" and from the ground up 18" at volumes of 4, 8, and 12 cc. per inch circumference of the trunk. (4 cc, barely wet; 8 cc, moderately wet, with no runoff; 12 cc saturated, solution running freely down the trunk into soil and roots.) Stumps were treated with same solutions and with 1/2, 1, and 2 lb. Ammate (active material) per gal. water at a liberal rate. Foliage applications were made in early spring and late summer with water and oil solutions and 10% oil-water emulsions containing 1, 2, 4, and 6 lb. ahg of the three hormone herbicides. Sprays were applied to the bottom half, the top half, and to one side of the tree canopy. Each plot consisted of 7 trees or more, 3 replications of each treatment.

Virtually all trees receiving liberal amounts of the basal sprays were top-killed. High volume (12 cc per in. diam.) low concentration (8 lb ahg) sprays appeared more effective in per cent foliage and root kill than low volume (4 cc per in. diam.) high concentration (32and 48 lb.) sprays. The roots of plants treated with 2 and 4 lb. ahg at high volume, with 2, 4, 8, and 16 lb. ahg at medium volume and 2, 4, 8, 16, and 32 lb. ahg at low volume appear alive, but no sprouts appeared this year. The higher concentrations in each rate apparently killed the roots. Even the lowest rates (and all higher ones) of 2,4-D, 2,4,5-T, Brush Killer and Ammate were effective in preventing resprouts from hawthorn stumps.

Poor results were obtained from all foliage treatments. All sprayed leaves killed but none prevented regrowth of leaves. The herbicides were not translocated from one part of the canopy to the other. Only the leaves receiving the treatments were killed. (Ohio Agricultural Experiment Station.)

Honeysuckle control in winter. Owens, Clarence; and Willard, C. J. Japanese honeysuckle (Lonicera japonica), growing in and beside a pine windbreak was treated March 2 with the isopropyl ester of 2,4-D (Esteron 44), the polypropylene

glycol butyl ether ester of 2,4,5-T (Esteron 2,4,5), and of a 50-50 mixture of 2,4,-D and 2,4,5-T (Esteron Brush Killer), at rates of 1, 2, 4, and 8 lb., acid equivalent per acre in 40 and 100 gpa No. 2 diesel fuel, a 25 per cent oil-water emulsion, and water. Best control of honeysuckle was obtained with the 8 lb. rates of 2,4,5-T and Brush Killer in oil-water emulsion. All treatments caused virtually complete top-kill. Plots treated with 1 and 2 lb. of all herbicides in all diluents sprouted profusely. The restuls with 4 lb./A. were erratic. Water was inferior to both oil and oil-water emulsion as a diluent. The sprouts from plots treated with 8 lb./A. 2,4-D, 2,4,5-T and Brush Killer in oil-water emulsion were 30, 10, and 7 per cent, respectively, of the number of sprouts from 1 lb. in water. The 8 lb. rates of some of the herbicides in oil caused some damage to pines actually sprayed with them, but the damage was not considered serious. Retreatments were made June 9 with 8 lb. ahg Brush Killer in 100 gal. oil-water emulsion. Observations 3 months later showed only 1 per cent resprouting from the entire field. (Ohio Agricultural Experiment Station.)

Herbicides on Ailanthus. Owens, Clarence, and Willard, C. J. Tree of heaven (Ailanthus glandulosa) was treated in triplicate plots March 1, 1952, with 4, 8, and 16 lb. ahg of the polypropylene glycol butyl ether esters of 2,4-D, 2,4,5-T, and a 50-50 mixture of the two (Brush Killer) in No. 2 diesel fuel. The trunks were treated from the ground line up 18-20 inches on the trunk with liberal amounts of solution. All rates eventually caused complete top kill. No sprouts appeared from the immediate surroundings of the main trunk but from roots leading out from the main trunk. The underground part of the main trunk appeared dead. The average per cent of resprouting from the plots treated with the various herbicides was as follows: 4, 8, and 16 lb. ahg 2,4-D, 2,4,5-T, and Brush Killer; 100, 60, and 20 ; 75, 25, and 5 ; and 80, 30, and 5, respectively. Only the 16 lb. ahg solutions of 2,4,5-T and Brush Killer gave satisfactory control. (Ohio Agricultural Experiment Station.)

Killing willows - effect of trees standing in water on basal treatments. Owens, Clarence, and Willard, C. J. Willows in a drainage ditch, including Salix nigra, S. interior, S. rigida, and S. petiolaris, were treated on May 2, 1952, when the leaves were 1/3 full size by spraying the bases of the trunks. The treatments were the polypropylene glycol butyl ether ester of 2,4-D (Esteron Ten-Ten), 2,4,5-T (Esteron 2,4,5), and of a 50-50 mixture of these (Esteron Brush Killer) at rates of 2, 4, 8, and 16 lb. ahg in No. 2 diesel oil. The bases of the trunks at the time of treatment were submerged in 2"-12" water.

All basal treatments caused the death of the above ground trunks of all species. The leaves were killed within 10 days after treatment. On August 27 numerous sprouts had started from the roots of all species that had been top-killed by the basal sprays. The ground surrounding the plants treated was literally covered with sprouts, in contrast to the check plots, which showed no sprouts. This failure to kill the roots with basal sprays seems definitely related to the fact that the trees were standing in water when treated, so that the runoff did not reach the junction of trunk and root. A few scattering trees, of which the crowns were not under water when treated, were entirely killed. Foliage sprays applied to the same species on June 10, were 3 and 6 lb. ahg of 2,4-D and 2,4,5-T in water and in a 10 per cent oil-water emulsion, applied to wetting. S. nigra and S. rigida were killed by all of these applications.

Numerous sprouts appeared along the trunks of S. petiolaris and S. interior treated with 3 and 6 lb. ahg 2,4-D, and 3 lb. ahg 2,4,5-T in water. Eighty per cent of the plants of S. petiolaris and S. interior treated with 3 lb. ahg 2,4,5-T in water resprouted and 85 and 60 per cent, respectively, of these species treated with 3 and 6 lb. ahg of 2,4-D resprouted. Six lb. ahg of 2,4-D or 2,4,5-T in oil-water emulsion and

6 lb. ahg of 2,4,5-T in water prevented sprouting from all species. There was 5 per cent sprouting from S. interior treated with 3 lb. 2,4,5-T ahg in oil-water emulsion. Ohio Agricultural Experiment Station.

Basal treatments of poplar, paper birch, river birch, dogwood and river willow, 1951-1952. Pavlychenko, T. K. Large size aspens (Populus tremuloides) and paper birches (Betula papyrifera) and clumps of river birch (Betula nigra), dogwood (Cornus spp.) and willow (Salix spp.) in semi-dormant state were treated wet with ethyl ester of 2,4-D (Weedone Concentrate), butoxy ethanol ester of 2,4,5-T (Weedone 2,4,5-T) and mixtures of the two (Weedone Brush Killer 32) at concentrations of 1,000 and 2,000 ppm. in oil from ground level and 3 ft up. Results for 1951 were included on p. 160 of the NCWCC Report. On August 28, 1952, the final readings were taken. The poplars treated with 2,4,5-T were 100 pct. killed, tops and roots. Brush Killer 32 and Weedone Concentrate both produced large patches of dead bark as high as 5 ft above the spray line, but many cases failed to prevent the trees from refoliating. By this time the birch and dogwood have almost completely recovered from all treatments. Willows were consistently killed by all treatments excepting occasional stems that were apparently missed and showed some abnormal refoliation. From this work it appears that higher concentration of straight 2,4-D or mixture of 2,4-D and 2,4,5-T esters is needed on poplar, river birch and dogwood. Treatments in a semi-dormant state also seem to be less effective than in fully dormant state. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

Reaction of wild rose, hawthorn and Saskatoon berry to 2,4-D, 2,4,5-T and MCP, 1951-1952. Pavlychenko, T. K. In 1951, 10 x 12 ft replicated plots of rose (Rosa suffulta), hawthorn (Crataegus spp.) and Saskatoon berry (Amelianchor alnifolia) were treated in full foliage with 10,000 and 20,000 ppm. concentrations of MCP amine (Weedar MCP), ethyl, pentasyl and butoxy esters of 2,4-D (Weedone Concentrate, ACP649 and Weedone LV4), ester of 2,4,5-T (Weedone 2,4,5-T) and mixtures of 2,4-D and 2,4,5-T esters (Weedone Brush Killer 32 and ACP572). Preliminary results were given in the 1951 NCWCC Research report. The final records taken in 1952 are herein presented.

RESULTS: The rose bush was dead to the ground in all treatments excepting MCP being only partially effective: Weedone LV4, Weedone Concentrate and ACP649 all killed the tops to the ground but permitted numerous sprouts (60 to 100 pct.). The same was true of 2,4-D and 2,4,5-T mixtures, excepting that regrowth was less prevalent (30 to 80 pct.) Weedone 2,4,5-T killed tops to the ground and only occasional shoots were observed. Excepting MCP, the other chemicals produced practically 100 pct. top kill with no regrowth in Hawthorn. All treatments produced 100 pct. top kill with very occasional ground shoots in Saskatoon berry plots. MCP and Weedone Concentrate were somewhat easier than other treatments.

Species Treatment	Conc. ppm.	WILD ROSE Reaction 1951	WILD ROSE Reaction 1952	HAWTHORN Reaction 1951	HAWTHORN Reaction 1952	Saskatoon berry Reaction 1951	Saskatoon berry Reaction 1952
Weedar MCP	10,000	III	IV	III	II	III	II
Weedar MCP	20,000	III	IV			III	II
WC	10,000	III	II	II	I	II	II
WC	20,000	III	II			II	II
ACP649	10,000	III	II	II	II	II	I
ACP649	20,000	III	II			II	I
LV4	10,000	III	II	II	I	II	I
LV4	20,000	III	II			II	I
BK32	10,000	II	I	II	I	II	I
BK32	20,000	II	I			II	I
ACP572 (in oil)	10,000	II	I	II	I	II	I

ACP572 (in oil)	20,000	II	I			II	I
2,4,5-T	10,000	II	II	II	II	II	II
2,4,5-T	20,000	II	II			II	II

Reaction I - complete topkill, no regrowth; II - foliage and small branches killed, but main stems show green; III - foliage partly killed, branches remain alive; IV - plants tolerant to the chemical.

Weedar MCP - amine salt of MCP; WC - ethyl ester of 2,4-D; ACP649 - pentasyl ester of 2,4-D; Weedone LV4 - butoxy ethanol ester of 2,4-D; BK32 and ACP572 mixtures of 2,4-D esters; 2,4,5-T - butoxy ethanol ester. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

Foliage treatments of poplar, buckbrush and willow, 1951-1952. Pavlychenko, T. K. In 1951, 10 x 12 ft plots of poplar (Populus tremuloides), buckbrush (Symphoricarpos occidentalis) and willow (Salix spp.) were treated in full foliage with 10,000 and 20,000 ppm. concentrations of MCP amine (Weedar MCP), ethyl (Weedone Concentrate and Weedone Concentrate "Dilute"), pentasyl (ACP649) and butoxy tthanol (Weedone LV4) esters of 2,4-D, mixtures of 2,4-D and 2,4,5-T esters (Weedone Brush Killer 32 and ACP 572) and ester of 2,4,5-T (Weedone 2,4,5,-T). Results for 1951 were included in the NCWCC Report. These are the final records in 1952.
RESULTS: In Weedone LV4, ACP572 20,000 ppm., Weedone 2,4,5-T and MCP plots, the upper branches of poplar were dead. The main stems showed green, and few lower branches refoliated, particularly in MCP treatments. The top growth, frequently right to ground level, was killed in the remaining treatments but in all cases some regrowth was observed either from the roots or from live wood just above the ground. Buckbrush was killed mostly to the ground in all treatments but some regrowth from the roots was evident in all plots, particularly MCP. Repeated treatment is necessary. Willows were killed 100 pct. with no regrowth with all treatments.

		Poplar Reaction		Buckbrush Reaction		Willow Reaction	
Treatment	Conc. ppm.	1951	1952	1951	1952	1951	1952
Weedar MCP	10,000	III	III	III	II	II	I
Weedar MCP	20,000	III	III	II	II	II	I
WC	10,000	III	II	I	II	II	I
WC	20,000	II	II	I	II	II	I
WC "Dil"	10,000	III	II	I	II	II	I
WC "Dil"	20,000	II	II	II	II	II	I
ACP649	10,000	III	II	II	II	II	I
ACP649	20,000	II	II	II	II	I	I
LV4	10,000	III	II	II	II	II	I
LV4	20,000	III	III	II	II	II	I
BK32	10,000	II	II	II	II	II	I
BK32	20,000	II	II	II	II	II	I
ACP572 (in oil	10,000	II	II	II	II	II	I
ACP572 " "	20,000	II	II	II	II	II	I
2,4,5-T	10,000	II	III	III	III	II	I
2,4,5-T	20,000	II	III	II	II	II	I

(Contributed by Agr.Div., American Chemical Paint Co.,Saskatoon,Sask.)

Weedar MCP - amine of MCP; WC - ethyl ester of 2,4-D; WC "Dil" - WC reduced to 9.6 pct. ae.eq.; ACP649 - pentasyl ester of 2,4-D; Weedone LV4 - butoxy ethanol ester of 2,4-D; BK32 and ACP572 - mixtures of 2,4-D and 2,4,5,-T esters; 2,4,5-T - butoxy ethanol ester.

Foliage treatments of dogwood, river birch, chokecherry and silverberry, 1951-1952. Pavlychenko, T. K. In 1951, 10 x 12 ft plots of dogwood (Cornus spp.), river birch (Betula nigra) chokecherry (Prunus melanocarpa)and silverberry (Elaeagnus commutata) in full foliage were treated with amine of MCP (Weedar MCP), ethyl, pentasyl and low volatile esters of 2,4-D (Weedone Concentrate and Weedone Concentrate "Dilute", ACP649 and Weedone LV4), mixture of 2,4-D and 2,4,5-T esters (Weedone Brush Killer 32 and ACP572) and with ester of 2,4,5-T (Weedone 2,4,5-T). Results for 1951 were presented in the NCWCC Report. The final readings were taken in 1952. RESULTS: Dogwood was dead to the ground in all treatments, with only occasional sprouts from roots being observed in the 10,000 ppm. concentrations of Weedone Concentrate, ACP649, BK32 and ACP572, and both concentrations of Weedone Concentrate "Dilute". River birch was killed with no regrowth by MCP 20,000 ppm., and at both concentrations of LV4, ACP572, BK32 and Weedone 2,4,5-T. The remaining treatments had some live wood just above the ground, with a few abnormal shoots. In MCP,Weedone LV4 and ACP572 plots, the chokecheery showed some green wood and branches with nearly normal leaves and numerous shoots from the roots. Other treatments killed stems to the ground, but regrowth from roots was quite general. Silverberry was killed with no regrowth, by Weedone Concentrate. Other treatments, killed the tops but some sprouts from roots were observed in all plots.

Species		Dogwood Reaction		River Birch Reaction		Chokecheery Reaction		Silverberry Reaction	
Treatment	Conc. ppm.	1951	1952	1951	1952	1951	1952	1951	1952
Weedar MCP	10,000	III	I	II	III	III	III	III	II
Weedar MCP	20,000	III	I	II	I	III	III	III	II
WC	10,000	III	II	III	II	II	II	III	I
WC	20,000	III	I	III	II	II	II	III	I
WC "Dil"	10,000	III	II	III	II	III	II	III	II
WC "Dil"	20,000	III	II	III	II	II	II	III	II
ACP649	10,000	III	II	III	II	III	II	III	II
ACP649	20,000	III	I	III	II	II	II	III	II
Weedone LV4	10,000	III	I	III	I	III	III	III	II
Weedone LV4	20,000	III	I	III	I	III	III	III	II
BK32	10,000	III	II	III	I	II	II	III	II
BK32	20,000	III	I	III	I	II	II	III	II
ACP572 (in oil)	10,000	III	II	III	I	III	III	III	II
ACP572 " "	20,000	III	I	III	I	III	III	III	II
2,4,5-T	10,000	III	I	III	I	III	II	III	II
2,4,5-T	20,000	III	I	III	I	II	II	III	II

(Contributed by Agr.Div.,American Chemical Paint Co.,Saskatoon,Sask.)

Weedar MCP- amine of MCP; WC - ethyl ester of 2,4-D: WC "Dil" - WC reduced to 9.6% ae.eq.; ACP649 - pentasyl ester of 2,4-D; Weedone LV4 - butoxy ethanol ester of 2,4-D; BK32 - ester mixtures of 2,4-D and 2,4,5-T: 2,4,5-T - butoxy ethanol ester.

Overall dormant treatments of buckbrush, rose and chokecherry, 1952. Pavlychenko, T. K. and Bestrop, A. J. On March 31, 1952, 12 x 12 ft plots of buckbrush (Symphoricarpos occidentalis), rose (Rosa spp.) and chokecherry(Prunus melanocarpa) under 4 ft in height were given overall dormant treatments at concentrations of 25,000 and 50,000 ppm of MCP amine (Weedar MCP), ethyl ester of 2,4-D (Weedone Concentrate), mixture of esters of 2,4-D and 2,4,5-T (Weedone Brush Killer 32) and butoxy ethanol ester of 2,4,5-T (Weedone 2,4,5-T).
Results: The topkill in buckbrush was incomplete at both concentrations of Weedar

MCP and at 25,000 ppm of Weedone Concentrate with some branches developing abnormally greenish leaves. Other treatments killed the stems to the ground, but sprouts with abnormal leaves were growing from roots in all plots, ranging from a few in Weedar MCP to much larger numbers in Weedone 2,4,5-T. Rose stems were killed to the ground by all treatments, except Weedar MCP, and Weedone Concentrate (50,000 ppm), where some branches developed normal leaves. Regrowth from the roots was quite general in Weedar MCP, and only 5 pct. of abnormal shoots came up in Weedone 2,4,5-T 50,000 ppm. Chokecherry was killed by all treatments except 25,000 ppm of Weedar MCP. Considerable regrowth from the roots was present in all plots. The sprouts had somewhat abnormal leaves in all but the Weedar MCP plots.

Species Treatment	Conc ppm.	Buckbrush Reaction	Rose Reaction	Chokecherry Reaction
Weedar MCP	25,000	III	III	III
Weedar MCP	50,000	III	III	II
WC	25,000	III	II	II
WC	50,000	II	III	II
BK32	25,000	II	II	II
BK32	50,000	II	II	II
Weedone2,4,5-T	25,000	II	II	II
Weedone 2,4,5-T	50,000	II	II	II

(Contributed by Agr.Div.,American Chemical Paint Co., Saskatoon, Sask.)

NOTE: Reaction I - complete topkill, no regrowth; II - foliage and small branches killed, but main stems show green; III - foliage partly killed, branches remain alive; IV - plants tolerant to the chemical

Weedar MCP - amine of MCP. WC - ethyl ester of 2,4-D. BK32 - butoxy ethanol esters of 2,4-D and 2,4,5-T. Weedone 2,4,5-T - butoxy ethanol ester of 2,4,5-T.

Foliage treatments of buckbrush, silverberry and rose, 1952. Pavlychenko, T. K. and Bostrop, A.J. Plots 12 x 12 ft of buckbrush (Symphoricarpos occidentalis) silverberry (Elaeagnus commutata) and rose (Rosa spp.) were treated in full foliage with 10,000 and 20,000 ppm. concentrations of: MCP amine (Weedar MCP); ethyl (Weedone Concentrate and Weedone Concentrate "Dilute"), butoxy ethanol (LV4, LV4 "Dil", ACP129 "Dil") esters of 2,4-D; esters of 2,4-D, 2,4,5-T and para (ACP912); esters of 2,4-D and 2,4,5-T (ACP572, BK32, BK32 "Dil", ACP977, ACP977 "Dil" and ACP131); acids of 2,4-D and 2,4,5-T (ACP926) and esters of 2,4,5-T (Weedone 2,4,5-T and Weedone 2,4,5-T "Dil"). All treatments were sprayed in 42 gal/A of water, except ACP572 (42 gal/A of oil).
RESULTS: Readings 68 days after treatment showed that buckbrush was quite resistant to MCP (r.III) but was killed to the ground by all other chemicals at both rates (r.II). ACP572, 977 and 2,4,5-T were the most consistently effective chemicals (r.I and II). Regrowth was absent in all plots. The response of Silverberry was practically identical to buckbrush with all chemicals (r.II). Rose was killed by both straight 2,4,5-T and 2,4-D plus 2,4,5-T mixtures, with only occasional sprouts. The MCP and 2,4-D treatments irrespective of formulation gave incomplete foliage kill and some damage to small branches. Regrowth from roots and occasionally from stems was quite prevalent (r.III). (Contributed by Agr.Div., American Chemical Paint Co., Saskatoon, Sask.)

Overall dormant treatments of buckbrush and rose with mixtures of systemic herbicides and TCA, 1952. Pavlychenko, T.K. and Bestrop, A.J. On April 2, 1952, 12 x 12 ft plots of buckbrush (Symphoricarpos occidentalis) and rose (Rosa spp.) were given overall dormant treatments, at concentrations of 25,000 ppm., with MCP amine (Weedar MCP), ethyl ester of 2,4-D (Weedone Concentrate), esters of 2,4-D and 2,4,5-T (BK32) and ester of 2,4,5-T (Weedone 2,4,5-T). Another series of plots was treated, using each of the above chemicals mixed with sodium trichloroacetate (NaTCA), at concentrations of 58,000 ppm. in water and applied with 40 gal/A nozzles.

RESULTS: Most of the treatments with systemic herbicides alone gave complete foliage and very considerable top wood kill but failed to prevent some abnormal foliation on lower branches. Regrowth from roots, also abnormal, was fairly general. Mixtures of the materials listed above and TCA killed the top growth to the ground, and the regrowth from roots was scarce and also abnormal. In wild rose Weedar MCP and Weedone Concentrate gave incomplete kill of the lower branches and regrowth from roots was quite general. Mixed with TCA, both chemicals gave a better top kill and much less regrowth. BK32, Weedone 2,4,5-T and their mixtures with TCA killed the tops to the ground. The mixtures, however, were much more effective in preventing regrowth, which was abnormal in all treatments.

Treatment	Conc. Syst. herb	TAC	Buckbrush Reaction	Rose Reaction
MCP	25,000		III	IV
MCP & TCA	25,000	58,000	II	III
WC	25,000		II	III
WC & TCA	25,000	58,000	II	III
BK 32	25,000		II	II
BK32 & TCA	25,000	58,000	II	II
2,4,5-T	25,000		II	II
2,4,5-T & TCA	25,000	58,000	II	II

(Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

NOTE: Reaction I - complete topkill, no regrowth; II - foliage and small branches killed, but main stems show green; III - foliage partly killed, branches remain alive; IV - plants tolerant to the chemical.

MCP - MCP amine; WC - ethyl ester of 2,4-D; BK32 - esters of 2,4-D and 2,4,5-T; 2,4,5-T - ester of 2,4,5-T. TCA - sodium trichloroacetate.

Foliage treatments of poplar, chokecherry and hawthorn with systemic herbicides, 1952. Pavlychenko, T.A. and Bestrop, A.J. Plots 12 x 12 ft of poplar (Populus tremuloides), chokecherry (Prunus melanocarpa) and hawthorn (Crataegus chrysocarpa) were treated in full foliage with 10,000 and 20,000 ppm. concentrations of MCP amine (Weedar MCP): ethyl (Weedone Concentrate and Weedone Concentrate "Dilute") and butoxy ethanol (Weedone LV4, LV4 "Dil", ACP129 "Dil") esters of 2,4-D; esters of 2,4-D, 2,4,5-T and para (ACP912); esters of 2,4-D and 2,4,5-T (ACP572, BK32,BK 32"Dil", ACP977, ACP977 "Dil", and ACP131); acids of 2,4-D and 2,4,5-T (ACP926) and ester of 2,4,5-T (Weedone 2,4,5-T and Weedone 2,4,5-T "Dil"). All the chemicals were applied in water with the 42 gal/A nozzle, except ACP572 which was applied in oil.

RESULTS: 64 days after treatment, the 3 species gave reaction II at both concentrations of the great majority of the 16 chemicals used. Hawthorn alone definitely was more resistant to MCP amine and gave reaction III. ACP572, 131 and Weedone 2,4,5-T were very destructive to poplar and produced reaction I at both concentrations.

Foliage treatments of dogwood, birch and willow, 1952. Pavlychenko, T.K. and Bestrop, A.J. Plots 12 x 12 ft of dogwood (Cornus spp.), birch (Betula nigra) and willow (Salix spp.) were treated in full foliage with 10,000 and 20,000 ppm. concentrations of MCP amine (Weedar MCP); ethyl (Weedone Concentrate, Weedone Concentrate "Dil"), and butoxy ethanol (Weedone LV4, LV4 "Dil", ACP129 "Dil"), esters of 2,4-D; esters of 2,4-D, 2,4,5-T and para (ACP912); esters of 2,4-D and 2,4,5-T (ACP572, BK32, BK32 "Dil", ACP977, ACP977 "Dil" and ACP926) and ester of 2,4,5-T (Weedone 2,4,5-T and Weedone 2,4,5-T "Dil"). ACP572 was applied in oil with nozzles discharging 42 gal/A, the other materials with the same discharge of water.
RESULTS: The fall readings showed some variations in top kills, and particularly in the amount of regrowth in different plots. Yet of the 16 chemicals used, none gave results weaker than reaction II on the 3 species. Weedone Concentrate was consistently very effective on the dogwood and gave reaction I at both concentrations.

Control of mesquite with ground equipment. Phillips, W.M. and Fisher, C.E. Mesquite may be effectively controlled by application of chemicals to cut surfaces, basal areas of plants and to the foliage and stems of sprout growth and plants 3 to 5 feet tall. The high cost of these treatments due to labor and chemicals limits their use to areas with sparse stands of mesquite, small odd lots, fence rows and to those areas where the more economical aerial application is not adapted. For control of small plants or sprout growth 3 to 5 feet tall 1 pound acid equivalent of a low volatile ester or amine of 2,4,5-T in 50 gallons of water applied as a drenching spray to the foliage and stems has given good control of mesquite. This application should be made in the spring when mesquite is in heavy foliage. Water appears superior to oil-water emulsions and oils as a carrier for 2,4,5-T applied with ground equipment to foliage. For treatment of cut surfaces, and basal areas of plants 1 pound equivalent of 2,4,5-T ester in 10 gallons of diesel oil or kerosene has given effective control of mesquite when all plant parts were thoroughly covered to the point of runoff with the solution. Failure to wet all the stems and soil around the base of the plants will reduce effectiveness of the treatment. Water and oil-water emulsions have not been found to be as effective as oils when treatments are applied to cut surfaces and basal areas of plants. Seasonal treatments indicate that late summer and early fall application will give most effective control, although winter and spring applications frequently give good control. The most effective treatment, although usually more expensive and laborious, consists of pouring kerosene or diesel oil around the base of plants in sufficient amounts to wet the dormant sprout buds on the underground stems. On single trunked trees 1 to 2 quarts of oil per tree will usually give highly effective control. Thin stands of mesquite growing on dry, rocky or porous soils may be controlled effectively at relatively low cost with this method. (Contributed by the Division of Weed Investigations, BPISAE, USDA, and the Texas Agr. Experiment Station, Spur, Texas.)

Chaparral or Lote control. Phillips, W. M. and Fisher, C. E. Condalia obtusifolia, a thorny shrub, is generally of minor importance on rangeland, although under local conditions it may be a problem. Effective control may be obtained by thoroughly spraying the foliage and stems during the growing season with a 1 per cent acid solution of 2,4,5-T ester or a mixture of 2,4-D and 2,4,5-T esters. Oil or oil-water emulsions are generally superior to water as a

carrier. Oil solutions of 2,4,5-T ester have been effective in the dormant season when applied in amounts to thoroughly wet cut surface and basal parts of the plants. Aerial applications of 2,4,5-T during the growing season have given fair to good top kills but nearly all plants showed some regrowth from the roots 12 to 24 months after treatment. (Contributed by the Division of Weed Investigations, BPISAE, USDA, and the Texas Agricultural Experiment Station, Spur, Texas.)

Dormant treatment of woody growth with mixture of butyl ester 2,4-D and isopropyl ester 2,4,5-T. Playfair, L.G. Following successful dormant spraying of plots, machine spraying of power lines in various parts of Manitoba was carried out from October 1951 to January 1952 and during April 1952. Approximately 200 miles of right-of-way was treated, using a Buffalo turbine and approximately 2 lbs. acid equivalent per acre of a mixture of 2/3 2,4-D and 1/3 2,4,5-T in 10 Imperial gallons light deisel fuel oil per acre. Where right-of-way exceeded 30 ft. in width the spray was applied from both sides. Growth was mixed and to a height of 25 ft. consisting of white poplar, choke cherry, saskatoon, bur oak, hazel, hawthorne, willow, wild rose and black poplar. First examination in June, 1952 indicated a complete kill of all growth but later in summer the oak showed some leafing and some regrowth noted on hazel. Exceptionally good kill on poplar. Some difficulty encountered due to freezing and separation of acid in barrels of the chemical as temperature was, at times, well below zero. Contribution of Manitoba Power Commission, Winnipeg, Manitoba.

A comparison of rates and volumes for brush control with airplane spraying. Shafer, Neal E. Aerial spraying treatments were made June 29, 1951, and results reported here were noted June 12, 1952. Plots were located on the first flood plain of the Republican river in south-central Nebraska. Woody species in descending order of frequency were cottonwood, green ash, box elder, white and red elm, and buckbrush. The area had been flooded in 1937 after which a heavy stand of cottonwood had become established. The cottonwood, which made up about 90% of the woody population, ranged from 4 to 10 inches in diameter and 40 to 60 feet in height. Four treatments were applied to single 5 acre plots. These were 2 lb iso-ester in 5 gal diesel oil/Acre, 2 lb low volatile ester in 5 gal diesel oil/Acre, 4 lb concentrated butyl ester (8 lb/gal) in 5 gal oil/Acre, and 4 lb concentrated butyl ester (8 lb/gal) in 1 gal diesel oil/Acre.

Results from the 2 lb rates of either isopropyl or low volatile ester (butoxy ethanol) were generally unsatisfactory. A few trees were killed but the main affect was a reduction in the amount of foliage on the remaining trees. Actual counts were made in the other two plots by walking a straight line and counting alive and dead trees. The 4 lb rate in 5 gal of diesel oil carrier gave a ratio of 56 dead trees to 5 alive. The same rate of chemical in 1 gal of oil gave a ratio of 34 dead to 32 alive. Trees under 12 feet tall were not counted. (Contribution of the Department of Agronomy, Nebraska Agricultural Experiment Station, Lincoln, Nebraska.)

Controlling western snowberry and other offending growth in native pastures with 2,4-D. Wood, H. E.; Howden, J. S. Through the assistance of Agricultural Representatives, 100 farmer co-operators with pastures heavily infested with Western Snowberry, Symphoricarpos occidentalis, and often other woody and weed growth, each undertook to spray approximately two acres, using 2,4-D butyl ester provided for the project by a leading chemical company. Application was made with farm sprayers using approximately 5 imperial gallons water and 1½ lbs. acid per acre; spraying was done from late May through June, in most cases before the snowberry flowered. At time of spraying, generally the weather was dry, but not unduly hot. Sufficient reports to hand in general indicate very

satisfactory results. In rating "kill" obtained, the range was from an occasional one as low as 50% to some almost 100%, an average of 80%. Most co-operators felt re-spraying in 1953 should give about complete eradication. About 65% of the co-operators indicated some improvement in the stand of grass following treatment. In late June, in Winnipeg, a few hours after a 1.9 inches rain square rod plots of dense snowberry in bud were knapsack sprayed at the rate of 1½ lbs. acid per acre using 1 imp. gal. water, whereby a standard 2,4-D butyl ester was compared with a low volatile ester of 2,4,5-T. By October a nearly complete "kill" was obtained on both plots even though earlier in the season the 2,4-D plot looked rather more promising. (Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada.)

Effect of droplet size of airplane spraying equipment on spray patterns and control of mesquite. Fisher, C.E. and Phillips, W. M. Comparison of aerial spraying equipment which delivered solutions in varying droplet sizes ranging from fine, medium coarse, moderately coarse to coarse was made in 1950. Droplet size was determined by flying over a paper tape at a height of 10 feet and spraying an oil-water emulsion of Rhodamine B dye at a rate of 4 gallons of solution per acre. Constant records were maintained of wind velocity and direction, temperature and humidity of the air. Distribution patterns with a 12-mile cross wind showed that fine droplets, estimated size 100 to 300 microns, produced a pattern of only 69 feet while medium coarse droplets, 350 to 450 microns, gave patterns of 123 feet. Furthermore, only a small shift in the pattern showing moderate coverage, approximately 15 per cent, occurred downwind when the wind increased from zero to 12 miles with moderately coarse droplets. In case of fine droplets a shift of 62 per cent occurred in the pattern showing moderate coverage. The loss of pattern together with the shift in pattern indicate that the loss of spray particles as drift was much greater when the fine droplets were used. In a comparison of droplet size for effectiveness of mesquite control each type of spraying equipment was used more or less simultaneously to treat 20-acre plots with solutions containing 3/4 pound of 2,4,5-T ester as acid in a 1:3 oil-water emulsion and in diesel fuel and 1 pound mixture of 2,4-D and 2,4,5-T ester as acid in an emulsion and in oil. Evaluations made 16 months later showed that coarse droplets, estimated size 450 to 500 microns, gave somewhat higher kills of mesquite while the use of fine dropletsand medium coarse droplets gave about the same percentage kill of mesquite. There appears to be no significant relationship between droplet size and carrier or chemical used in these studies. With the increased possibilities of drift from the use of fine droplets without any apparent increase in effectiveness it appears desirable to use equipment that delivers coarse droplets ranging in size from 400 to 600 microns for control of mesquite. (Contributed by the Texas Agricultural Experiment Station, and Division of Weed Investigations, BPISAE, USDA, Spur, Texas.)

Control of mesquite with 2,4,5-T and other growth regulator herbicides applied by airplane. Fisher, C. E. and Phillips, W. M. Mesquite has been effectively and economically controlled by airplane application of 2,4,5-T experimentally under favorable conditions. Excellent top kills with 34 to 45 per cent of the plants showing no regrowth 28 months after treatment was obtained in tests made in 1949. Experimental applications in 1950 at 26 locations throughout the mesquite belt in Texas have given excellent top kills of mesquite regardless of size of plants, temperatures, humidity of the air, soil moisture and other environmental factors observed. On the other hand, regrowth from the underground buds of treated mesquite varied greatly with size of plants, site, season of treatment and perhaps other factors. For the most part small plants 2 to 10 feet tall showed root kills of 30 to 60 per cent and most new growth was inhibited while larger trees, 10 to 30 feet tall, showed root kills ranging from 0 to 15 per cent with varying amounts of inhibited new growth. In general applications

made when soil moisture conditions were above normal 60 days prior to treatment tende to show less regrowth from the base of plants but there appeared to be notable exceptions. The most desirable season for treatment was during the first heavy foliage stage in the spring. This occurred approximately 8 to 12 weeks after the first leave appeared in the spring, depending on moisture condition and low temperature of the preceding winter season. Applications before the first heavy foliage stage, or those made in the summer, fall, or dormancy were less effective, or resulted in failure, regardless of the amount of acid or carrier used. Rates of 2/3 pound of 2,4,5-T acid per acre consistently gave more effective control of mesquite and woods than lesser amounts and were equally as effective as greater amounts, even under less favorable conditions. Low volatile esters of 2,4,5-T appear most desirable for the control of mesquite due to proximity of hazard crops in the mesquite belt. The amine of 2,4,5-T appear promising while formulations of 2,4-D and mixtures of 2,4-D and 2,4,5-T were less consistent for the control of mesquite and more hazardous to use where susceptible crops are grown. Maximum control was obtained with 2/3 pound of 2,4,5-T low volatile esters in 4 gallons per acre of an oil-water emulsion containing 25 per cent water clear diesel. Other carriers tried have generally been less effective and more costly. Proper airplane application of herbicides has given more effective control of mesquite and common range weeds at lower cost than any applications made with ground equipment. (Contributed by the Texas Agricultural Experiment Station and Division of Weed Investigations, BPISAE, USDA, Spur, Texas.)

Low-Volume aerial spraying gives good kill of lowland brush in Minnesota. Roe, Eugene I. In mid-August 1951, 5-acre plots of lowland brush, located near Effie, Minnesota, and composed mostly of alder, willows, dogwood, swamp buckthorn, bog birch, and honeysuckle were sprayed from a light plane. Due to the presence of many snags from the spruce-tamarack forest which formerly occupied the area, flying had to be done at 50-60 feet above the ground. Herbicides used were the propylene glycol butyl ether esters of 2,4-D and 2,4,5-T in 50-50 mixture, and applied in a 25-percent No. 2 fuel oil solution at the rate of 1.14, 2.69, and 3.26 gals./acre; acid equivalents were 1.14, 2.69, and 3.26 lbs./acre respectively. Initial kill on all treatments was excellent. Detailed stem counts made on representative sample strips in late July 1952 show that considerable resprouting is taking place in most species. A final decision as to the relative value of the treatments will, therefore, have to wait for a year or two. To date, resprouting has been greater on the light treatment than on the heavy treatment. However, the latter is not enough better to justify the almost 3-fold greater cost of materials used on this treatment. The real test of the spraying is whether or not the area can now be reforested with planted black spruce without the need of expensive hand cutting to remove over-topping brush. Lake States Forest Experiment Station cooperating with the Minnesota Forest Service, Minnesota and Ontario Paper Company, Dow Chemical Company, and Minnesota Airplane Sprayers Association.

Herbicides show promise in brush release of planted conifers. Roe, Eugene I. A 1/10-acre plot on the Chippewa National Forest was sprayed (foliage) in early June 1951 to see if dense bigtooth aspen suckers could be killed back to release planted red pine and jack pine seedlings without appreciable harm to these conifers. The aspen which had originated after a fire two years earlier was about six feet high and averaged 6,200 stems per acre. Other competitors, hazel, willow, and choke cherry, brought the density up to 18,000 stems per acre. The herbicide used was a 50-50 mixture of the isopropyl ester of 2,4-D and the propylene glycol butyl ether ester of 2,4,5-T in a 3-percent water solution; acid equivalent, 0.65 lb./acre. Initial kill was excellent, particularly of the aspen. Resprouting during the first season was very light but considerably more during the second year. There are now 15,000 stems/acre but only 1,100 of these are aspen. The latter are short and not very vigorous. At present only 14 percent of the red pines and 23 percent of the jack pines on the plot need release compared to 91 percent of the conifers on the

adjacent check plot. Injury to the conifers from the herbicide has been much less severe than first appeared. Loss in jack pine was negligible, the injured trees making practically complete recovery. That in red pine was somewhat greater, about 10 percent of the trees being killed by the herbicide. Lake States Forest Experiment Station in cooperation with Chippewa National Forest.

Effect of respraying with 2,4-D on hazel. Roe, Eugene I. In earlier reports of this conference, it was reported that hazel (Corylus cornuta) was easily killed back by the polypropylene glycol butyl ether esters of 2,4-D and 2,4,5-T and 50-50 mixtures of these at the rate of 2,400 and 4,800 p.p.m. at any time from mid-June to late August (Roe, 1950, p. 247) but that this shrub showed considerable resprouting the second year (1951, p. 162). Accordingly, 10 of the original 36 1/30-acre plots were resprayed with the same ester of 2,4-D at 2,400 p.p.m. (acid equivalent, 1.04 to 1.20 lbs./acre) on August 24, 1951. Examination of these plots in July 1952 again showed considerable resprouting. On half of the plots there were more hazel stems than before the respraying, and on half there were fewer stems. On none, however, had the hazel regained its original numbers, the stand ranging from 14 to 86 percent of that when first sprayed in 1950. This shrub would, therefore, appear difficult to eradicate. Alder, on the other hand, is much more susceptible to herbicide control, this species having been completely killed out on four of the seven plots on which it occurred. An important side effect observed in these studies has been the great increase in density of herbs and other low ground cover as that of the brush has decreased. From the competition standpoint, such plants may be as serious as the taller shrubs. Lake States Forest Experiment Station, Grand Rapids, Minnesota.

SPRING SOWN GRAIN

Summary

P. J. Olson.

The abstracts submitted reported the reaction of the crops themselves as well as that of the weeds grown within them.

As regards reaction of crops to chemicals, oats received major emphasis. Several workers reported that the crop was particularl vulnerable during a relatively short period extending from the early 7-leaf into the very early boot or shot blade stage. This supports the findings reported in 1951. There were several other vulnerable stages which came to light under heavier rates of application, especially of esters. Some workers found no significant reductions in yield resulting from treatment at any stage, but actual yield differences suggested the situation just described.

Comparison between 2,4-D and MCP was reported by several workers. All of them found an advantage, (in many cases small), for 2,4-D over corresponding formulations of MCP in control of weeds including wild mustard, stinkweed (Thlaspi arvense L), Russian thistle and wild buckwheat. (One worker gound MCP giving no control of Russian thistle, while all formulations of 2,4-D gave good control). Where damage to the crop was recorded, MCP showed less damage than 2,4-D.

The use of CMU in wheat and barley was reported upon by three workers. Good control of wild buckwheat, lady's thumb and barnyard millet was obtained at rates of 1, 2 and 3 pounds. Rates of ¼, ½ and 1 pound per acre gave good control of Russian thistle and depressed yield only at the 1 lb. rate. Tartary buckwheat in barley was controlled with 1 lb. CMU per acre without injury to barley according to one report, which also indicated negative results for Crag herbicide.

Monosodium cyanamid at 40 and 100 lb. per acre controlled Russian thistle in barley, but the 100 lb. rate damaged the crop severe according to one report. The same report indicates that maleic hydrazide at 2, 4 and 8 lbs. destroyed both Russian thistle and barley completely.

The question of the effectiveness of chemical treatment in terms of increased yield of crop often presents itself. Several workers reported that significant increases in wheat yield were obtained when applications of 2,4-D were made at favourable rates and stages of growt

When butyl ester was applied to wheat 6 - 7 inches tall containing 0, 10, 25, 50, 100, 200 and 400 common mustard plants/sq. yard, 8-9 inches tall there was a gradual decrease in yield in both the treated and untreated plots as the weed concentration increased. There was no significant difference between treated and untreated plots showing that effective competition between weed and crop had already taken place by the time treatment was applied.

One abstract reported the results of chemical treatment as regards permanent reduction in weed population. Annual treatment with 2,4-D for 6 years to crops and summerfallow reduced a moderate infestation of susceptible weeds to a point where treatment would not have been practical the sixth year.

Effect of 2,4-D on oats in 1952. Brown, D. A. Butyl ester and amine 2,4-D were used at rates of 4 and 8 oz./a. acid and salt equivalent respectively. Exeter was the variety used. Crop was treated at 20 stages of growth between emergence until heading was complete. The interval between treatments was 3 - 4 days. Amine at the 4 oz. rate gave evidence of only slight injury to the oat plants from the time of emergence up to very early shot-blade stage. At 8 oz., amine gave more pronounced injury over the same period. Ester at 4 oz. produced all usual manifestations of injury in greater severity than amine at 8 oz. but considerably less severe than ester at 8 oz. The highest incidence of injury from all treatments occurred from the time plants developed the first node to the time heads were well formed (early shot-blade). Injury was mainly expressed in stiffened, discolored foliage, onion leaf, enlarged nodes, twinning of stems, panicles and spikelets, "side oats", uneven length of straw, induced blast and sterility, weakened straw and lower yields. Check plots yielded 117 bu./a. Lowest yields in treated plots were: ester 8 oz. 81 bu./a. (crop 4 in. high), ester 4 oz. 90 bu./a. (crop 9 in. high); amine 8 oz. 99 bu./a. (Crop 8 in. high), amine 4 oz. 105 bu./a (crop 13 in. high), least significant differences at 5 per cent point 9.4 bu., at 1% point 12.3 bu. (Contribution from Experimental Farm, Brandon, Manitoba, Canada.)

Reaction of oats to 2,4-D butyl ester when applied at 20 different stages of growth. Burrows, V. D. and Olson, P. J. 2,4-D butyl ester was applied as a spray to Exeter oats at 6 oz. acid equivalent/A. Treatments were begun before emergence and continued at intervals of approximately 3 days until after heading. No significant yield reductions were found for any date of treatments. However, very low yields were recorded from treatments applied at the 4 and 5 leaf stages (5 - 8 in. in height). These stages yielded 17.76 and 18.26 bu./A less then the check. (LSD - 19.76 bu./A). The damage caused by treating at this stage was readily noticeable in the fields. The oat plants were very erect and had narrow leaves. Another apparent reduction occurred at the 6 - 7 leaf stage, (20 in.). This stage yielded 15.96 bu./A lower than check. These plots were 2-3 in. taller than any other plots in the experiment. (Contribution, Division of Plant Science, University of Manitoba, Winnipeg).

The effect on yield of Exeter oats (sown at two rates) by treating with two rates of 2,4-D ester (butyl) and amine (mixed) at four dates. Burrows, V. D. and Olson, P. J. 1952. A split plot experiment was conducted to determine the effect of 2,4-D treatment on yield of oats seeded at different rates. In previous experiments, early treatment resulted in damage to the main culm. With this in mind, it was thought that a light seeding rate, which would favor tillering, might compensate for this damage. The oats were sown at 1½ and 3 bus. per acre. Treatments of 3 and 6 ounces (acid equivalent) of ester and 4 and 8 ounces (acid equivalent) of amine were applied at 1, 2, 3 and 6 leaf growth stages. The differences in the mean yields for chemicals, rates of seeding and dates of treatment were found to be not significant. Evidently damage to the main culms by early treatment was compensated for in all cases by tillering. The plants at the fourth date of treatment (6 leaf) were evidently resistant. (Contribution from the Division of Plant Science, The University of Manitoba, Winnipeg, Canada.)

The effect on Lee wheat of various concentrations of mustard plants (Brassica arvensis) and of their removal by 2,4-D butyl ester. 1952. Burrows, V. D. and Olson, P. J. Mustard concentrations of 0, 10, 25, 50, 100, 200 and 400 plants/sq. yard were established in plots simultaneously sown to wheat at 2 bu./A. (4 replications). The various concentrations established in blocks were obtained by careful counting at the time of their emergence. Excellent stands of both weeds and crop were obtained. The blocks were divided into treated and untreated halves. 2,4-D butyl ester was applied at the rate of 6 oz. acid equivalent/A. when the wheat was in the 5 leaf (average 6-7 in., stretched 12-14 in.) stage of growth and the mustard in the 5 - 7 true leaf stage (8 - 9). Excellent control was obtained. The treated plots were 1 - 3 in. shorter than the untreated. The number of culms per plot, straw yields and yield (bu./A) decreased significantly with increase in concentration of weeds. There was no significant difference between the treated and untreated plots. The yields in bu./A were as follows: Treated (0),40.71, (10) 37.50, (25) 37.12, (50) 35.31, (100) 28.66, (200) 27.65, (400) 27.23. Untreated (0) 36.53, (10) 35.74, (25) 36.99, (50) 32.21, (100) 29.21, (200) 30.91, (400) 25.87. The reduction in yield of treated plots with increased weed concentration is notable. Evidently tillering was reduced by the weeds before treatment. Treatment was probably not applied early enough to eliminate the effect of the weeds on this character. High moisture conditions (10.15 in.) during the growing season may have been another reason why the treated and untreated plots showed no significant difference in yield. (Contribution, Division of Plant Science, The University of Manitoba, Winnipeg).

Relative effect of MCP and 2,4-D on yield of oats, 1952. Coupland, R. T. 7 rod-row (6 in. between rows) plots of Fortune oats were sown in quadruplicated randomized blocks on May 1 at Saskatoon. Emergence occurred on May 16. A moderate stand of volunteer Russian thistle (Salsola pestifer A.Nels.) was treated with 4 and 8 oz. of 2,4-D ester (butyl) and MCP ester (butyl) in 7.1 Imperial gal. of water at three stages of development. These stages were: May 23, 3 to 5 in. high, 2 to 4 leaves; June 14, 8 to 9 in., 4 leaves; June 27, 14 to 20 in., early boot. Weed control was better from the 2,4-D treatments than from the MCP treatments at the same rate. MCP caused less damage to oats than the same rate of 2,4-D. Accordingly, despite the poorer weed control in MCP treatments the yield of oats was greater than in the plots treated with 2,4-D. The 4 oz. MCP plots yielded 5, 14 and 8% more than the 4 oz. 2,4-D plots, respectively from the first, second and third treatments. Comparable increases for the 8 oz. MCP treatments over 2,4-D treatments were 4, 32, and 3% respectively, from the first, second and third treatments. The effect on yield of better weed control provided by the 2,4-D was more than offset by the greater damage caused, particularly in the second stage. The comparison in the yields of the plots treated with the same herbicide at two rates reveals that in the first stage the better weed control afforded by the 8-oz. rate approximately offset the greater damage caused by the heavier treatment, the yields being 2 and 1% higher than in 4-oz. plots from the 2,4-D and MCP treatments, respectively.. In the second stage this was only true of the MCP treatment, the 8-oz. plots yielding 1% more. The 8 oz. 2,4-D plots yielded 13% less than the 4 oz. plots. Reductions of 1% and 6% were recorded from the use of 2,4-D and MCP, respectively, in the third stage. The yield compari-

son between the MCP 4 oz. treatment and the untreated weed infested checks were an 11% increase and 11% decrease, respectively, and from the first and second treatments, while in the third stage the yields were the same. (Contribution from the Dept. of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

Relative effects of 2,4-D and MCP in control of Russian thistle (Salsola pestifer A. Nels.) in wheat, 1952. Coupland, R. T. Quadruplicated 7 rod-row plots of wheat in 6-inch spacings were sown on May 1 at Saskatoon. Treatment was made at three stages with 8 oz. of 2,4-D ester (butyl) and MCP ester (butyl) at three stages. The stages were: June 3, wheat 6 in. high; June 25, wheat 10 to 14 in. high, 4 to 5 leaves, 3 to 5 tillers; and July 16, wheat 25 in. high, headed. Volunteer weed stands were principally Russian thistle. The height of this weed averaged 3, 6 and 14 inches, respectively, before treatment on the three dates. The mean yield of wheat from MCP treated plots was 18% less than in the 2,4-D plots treated at the first stage. Comparable data for the second and third stages of treatment were a 10% decrease and 4% increase, respectively. The mean yield of straw at harvest was greater in MCP plots in all stages of treatment. These increases above the 2,4-D treated plots were 2, 14 and 8%, respectively, for the first, second and third treatment. The air-dry weight of weeds (above ground parts) present at harvest was greater in the MCP treated areas, being increased 112%, 146 and 48% respectively, above the plots treated with 2,4-D at the first, second and third stages. MCP would appear to be less effective in controlling Russian thistle than 2,4-D, but possibly is not as detrimental to wheat at the susceptible stages. (Contribution from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

Comparative effect of two rates of 2,4-D on Russian thistle in wheat, 1952. Coupland, R. T. Quadruplicated plots of wheat (7 rows, 1 rod long and 6 in. apart) were sown on May 1 at Saskatoon. Russian thistle (Salsola pestifer A. Nels.) was seeded on the same date between the rows. A heavy stand of weed resulted (ave. of 148 plants per 0.92 square yard at harvest). This was treated with 2,4-D ester (butyl) at 0, 4 and 8 oz./A. in 7.1 Imperial gal. of water at three stages: June 3 - wheat 6 in. high, weed 3 in.; June 25 - wheat 10 to 14 in., weed 6 in.; July 16 - wheat 25 in. and headed, weed 14 in. The yield of wheat from the first treatment date was reduced below the weed-free untreated check by 32, 25 and 17%, respectively, in plots treated at the 0, 4- and 8-oz. rates. Comparable data for the second stage of treatment were 49, 42 and 40%, and for the third treatment were 45, 32 and 30%. These yields reflect the degree of control of the weed as expressed in terms of air-dry weight of above-ground parts. Less weed growth remained at harvest in the 8-oz. plots, being 15, 76 and 77% of that in the 4-oz. plots, respectively, in the first, second and third stages of treatment. The 4-oz. plots produced 58, 53 and 100% respectively, of the weed yield of the untreated weed-infested plots in the three dates of treatment. These data indicate that in heavy infestations of Russian thistle applications greater than the 4-oz. rate most commonly used in this are are advisable. (Contribution from the Dept. of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

A comparison of the effectiveness of two rates of 2,4-D on Russian thistle (Salsola pestifer A. Nels.) of different intensities of stand. 1952. Coupland, R. T. Quadruplicated 7 rod-row plots of wheat (6 in. between rows) were seeded at Saskatoon on May 1. Some wer infested heavily the same day with seed of Russian thistle. The remaining plots were less heavily infested by volunteer seedlings. 2,4-D ester (butyl) was applied on three dates at 4 and 8 oz./A. The stages were: June 3, wheat 6 in. high, weed 3 in.; June 25, wheat 10 to 14 in. high, weed 6 in.; July 16, wheat 25 in. high and headed, weed 14 in. Mean yield of wheat in heavily infested plots was less than plots with volunteer stands treated at the same rate and stage. The reductions averaged 21, 30 and 23% respectively, at the 4-oz. rate in the first, second and third stage. The corresponding reductions with the 8-oz. rate were 15, 19 and 30%. These data indicate that at usual rates of application of 2,4-D, the use of herbicide will not entirely overcome the depression in yield of crop resulting from the higher population of Russian thistle in very weedy land. This reduction in crop yield is associated with a greater production of weed tissue. Air-dry weights of weed produced in the very weedy plots treated with 4 oz. of 2,4-D averaged 18, 12 and 8 times greater, respectively, in the first, second and third stages than in the less weedy plots treated at the same rate. Comparable data for the 8-oz. rate were 3.5, 7 and 5. (Contribution from the Dept. of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

Reaction of oats to 2,4-D applied at twenty stages of growth. Friesen, H. A. The butyl ester and the amine (mixed amines) at dosages of ¼ and ½ pound of acid equivalent/A. were sprayed at three-day intervals on plots of Exeter oats. The first treatment was made when the oats were in the one to two leaf stage and the last after the kernels had begun to fill. Results: Amine at ¼ pound resulted in slight plant deformities (onion leaves) from two leaf to the jointing stage; yields were not significantly affected. At the jointing stage (date 7) the yield was significantly reduced, onion leaves and floret sterility were quite severe. Plant deformities or yield depressions were not observed as the result of this treatment when applied after the very early shot blade, date 9. Amine at ½ pound produced very similar effects except that the deformities were more pronounced. Again only at date 7 was the yield significantly depressed. The ester at ¼ pound had much more severe effects on the crop. Onion leaves, enlarged, stiffened stems and nodes, multiple stems and panicles, curled tillers, sterile florets and fused kernels were observed from two leaf until shot blade, dates 1 to 11. However, the injury was much more severe about the jointing stage with significant yield reductions at dates 5, 7, 8, 9 and 10. Ester at ½ pound markedly increased both the incidence and severity of the plant injury described for the ester at ¼ pound. Again the damage was most severe at the jointing stage. Significant yield depressions resulted at dates 2 to 11, inclusive. In 1952 oats were much more tolerant to amine than ester; the critical period occurred when the plants were 6 to 11 inches tall. (Contributed by the Dominion Experimental Station, Scott, Saskatchewan.)

Effect of some of the newer herbicides on annual weeds in Wheat. Friesen, H. A. In 1952 a number of the more recently developed

herbicides were applied to wheat in the 5 to 6 leaf stage. The weed population, composed entirely of Russian thistle, was very light and non-uniformly distributed. The herbicides used were MCP, butyl ester, amine and sodium salt; low volatile esters; 2,4-D, butyl and isopropyl ester, and alkanolamine amine, and 2,4-5T each at ¼ and ½ pound of acid/A. CMU at ¼, ½ and 1 pound/A; XI, potassium cyanate at 8 and 12 pounds, X5, monsodium cyanamid at 40 and 100 pounds, maleic hydrazide at 2, 4 and 8 pounds and DNOSBP at 3 quarts/A were also applied. Results: the 2,4-D and low volatile esters gave very satisfactory control of Russian thistle. The MCP formulations resulted in essentially no control of this weed. Because of light weed infestation none of the treatments influenced the yield. The low volatile esters at the ½ pound rate tended to deform the plants and depress the yield by some 10-25 per cent. CMU at each rate controlled the Russian thistle, but depressed the yield at the 1 pound rate. XI and X5 gave satisfactory weed kills at both rates used, but the heavy rate of each seriously depressed the yield. Maleic hydrazide virtually stopped the growth of both wheat and weeds until early August at which time all the plants died. The DNOSBP did not materially affect either the crop of the weeds. (Contributed by the Dominion Experimental Station, Scott, Saskatchewan).

Effect of herbicides on annual weeds in wheat on summerfallow. Friesen, H. A. Experiments to determine the merits of herbicides for the control of annual weeds in wheat as measured by yield differences and weed control have been conducted over the past six years. Well prepared summerfallow was used in each of these years and weed seeds were not sown in the plots. In 1952 the butyl ester (2,4-D) at dosages of 1/8, 1/4, and 1/2 pound; an amine (mixed amines of 2,4-D) and an MCP amine each at ½ pound acid equivalent/A were sprayed at 12 stages crop growth. The first spraying was to be made at emergence of the grain and sprayings were to follow at six day intervals thereafter. Due to wet weather this schedule could not be closely adhered to. The weed infestation was moderately heavy and was composed of Thlaspi arvense 90 per cent, Salsola pestifer 7 per cent and Polygonum convolvulus 3 per cent. Each treatment resulted in kills of Thlaspi ranging upwards of 85 per cent when applied prior to the late flowering stage. Similar kills of Salsola were observed following the 2,4-D treatments, however MCP resulted in very poor kills of Salsola. Polygonum was not materially affected by any of the treatments. At stage 1, when the crop was 3 inches tall, each treatment resulted in deformed plants and significant reductions in the yield of wheat. None of the treatments made during stages 2 to 7, when the crop advanced to the late boot stage significantly reduced the yield, except the ester at ½ pound at stages 6 and 7. Significant yield increases were noted at stages 2, 4 and 5. On the basis of yields and weed control the best time to spray was stage 2, i.e. when the weeds were seedlings and the grain was 5 inches tall. The butyl ester of 2,4-D at ¼ pound of acid/A applied at the above growth stage has increased the average yield of wheat by 2.7 bushels per acre over past six years. At stage 8, when the grain was heading, each treatment depressed the yield. At stages 9 to 12 there was no noticeable effect on the crop, however, sprayer damage to the tall maturing grain depressed the yield at stages 10, 11 and 12. Wheat appeared to be only slightly more tolerant to MCP than to the 2,4-D. (Contributed by the Dominion Experimental Station, Scott, Sask.)

The effect of 2,4-D ester (butyl) on Ajax and Exeter oats applied at 30 different stages of growth in the greenhouse. 1951 and 1952. Friesen, G. and Olson, P. J. Pots of Ajax oats (1951) and Exeter oats (1952) were treated with 12 oz and 6 oz/A respectively, at 30 stages of growth, beginning shortly before emergence and continuing at 2-day intervals until well past the heading stage. The heavier rate applied in 1951 caused highly significant yield reductions at all stages from emergence to heading, (the 2nd through the 25th treatments). The lighter 1952 treatment caused significant reductions at all stages from emergence to the 6 leaf stage (the 2nd through the 18th treatments except for one treatment, the 15th.) The next five stages, extending into the 7 leaf stage (34 inches tall) showed no yield reduction. The following two stages (panicle emerging, 24th and 25th treatments) again showed highly significant yield reduction. In 1951, particularly severe damage occurred during 2 periods: the first an early seedling period when the plants were in the 2-leaf stage (1½ to 6 inches long, stretched - 4 treatment stages); the second was a short period during the early boot stage (2 treatments, 13 and 10 days before heading). The first period was that during which leaf initials in main culms and tillers were being laid down and was associated with leaf deformities. The second corresponded to early stages of development of the floral parts and was associated with a high degree of sterility. The 1952 results showed a similar tendency, but were much less clear cut, especially as regards the onset of the second period. (Contribution from The Division of Plant Science, The University of Manitoba, Winnipeg, Canada)

Tartary buckwheat controlled in barley by CMU. Knowles, G. On an area infested with tartary buckwheat and seeded to barley these chemicals were applied before emergence; CMU at 1 and 1½ pounds/A and Crag herbicide No. 1 at 2½ pounds/A. After emergence when the barley was 6 to 8 inches in height these applications were made in a low volume of water; X5 30 pounds/A, CMU at ½, 1 and 2 pounds/A; Dow Selective at 2 and 3 quarts/A and 2,4-D amine at 4 ounces/A. ResultsL CMU as a post emergence treatment at the ½ pound per acre rate gave a 75% control, the 1 pound rate of CMU gave approximately 100% control of tartary buckwheat. Neither of these rates of CMU caused observable injury to the barley. All other treatments were quite ineffective in controlling this weed except the pre-emergence treatments with CMU. These gave good weed control but caused some injory to the barley. (Contribution of Central Experimental Farm, Ottawa, Canada

Results from the continus use of 2,4-D. McCurdy, E. V. For the past six years an ester, an amine, and a sodium salt have been applied to a replicated group of plots at 4 and 24 ounces acid/A. Wheat was grown in a three-year rotation and the application was made to the wheat on summerfallow, the wheat sown on stubble, and once each season to the weeds growing on the summerfallow. A moderate infestation of stinkweed, lamb's quarter, pigweed, and a few wild tomato and purslane were present at the beginning of the experiment and a notable reduction in weeds has taken place during the past six years. Actually the infestation was so light in 1952 that the application was unnecessary from a practical standpoint. The heavy rate of the ester has reduced the yield of wheat but the average yield of wheat on summerfallow from all treatments for the six-year period has been in the neighborhood of 40 bushels ~~of 40 bushels~~ to the acre. The application

of the 2,4-D to the summerfallow has had little value. So much wheat volunteers each year on the summerfallow fields that as many cultural operations are required for the fields receiving the 2,4-D as for the checks. (Contributed by the Dominion Experimental Farm, Indian Head, Saskatchewan).

Effect of systemic herbicides on weeds and wheat in the three leaf stage (Series 1 and 2), 1952. Pavlychenko, T. K. Replicated plots of wheat were treated in the 3-leaf stage with 3, 4 and 5 oz/A of ethyl esters of 2,4-D (standard and "Dilute"), low volatile butoxy ethanol esters (standard and "Dilute"), pentasyl ester of 2,4-D, emulsifieable acid of 2,4-D, amine of 2,4-D (ACP 127) acetanilide of 2,4-D, and with 4, 6 and 8 oz/A of amine of 2,4-D (Weedar) and amine salt of MCP (Weedar MCP). Acetanilide of 2,4-D was sprayed at 5 gal/A of Diesel fuel oil, while the remaining chemicals were applied in 5 gal/A of water. The crop was heavily infested with wild mustard (Sinapsis arvensis), stinkweed (Thlaspi arvense) and Russian Thistle (Salsola kali). The soil was clay loam and growing conditions favorable throughout the season. RESULTS. None of the treatments caused any appreciable effect on the stand, vigor or height of grain. Only acetanilide of 2,4-D, 5 oz/A caused as much as 2 days delay in maturity. None of the other chemicals caused a delay of more than 1 day. Weed control was practically complete with all chemicals, particularly at the 4 and 5 oz rates. Only amine of 2,4-D (ACP127) and amine salt of MCP (Weedar MCP) permitted some weeds to survive and these were in a severely damaged condition. Grain yields were increased by all treatments (1.4 to 14.5 bu/A). Contribution from Agr. Div. American Chemical Paint Company, Saskatoon, Saskatchewan).

Effect of systemic herbicides on oats treated under 6 in.in height (Series 1 and 3) 1952. Pavlychenko, T. K. Replicated plots of oats were treated when the crop was approximately 5 in high with 3, 4 and 5 oz/A of ethyl esters of 2,4-D (standard and "Dilute"),low volatile butoxy ethanol esters of 2,4-D (standard and "Dilute"), pentasyl ester of 2,4-D, emulsifiable ester of 2,4-D, amine of 2,4-D (ACP127) and acetanilide of 2,4-D. The latter was sprayed in 5 gal/A of Diesel oil; the remaining chemicals in the same quantity of water. Treatments were also made with 4, 6 and 8 oz/A of amine of 2,4-D (Weedar) and amine salt of MCP (Weedar MCP). The crop was heavily infested with wild mustard (Sinapsis arvensis), stinkweed (Thlaspi arvensis) and Russian thistle (Salsola Kali). The soil was clay loam, and the growing conditions favourable throughout the season. RESULTS: The crop proved to be fully tolerant to all treatments except acetanilide of 2,4-D, which produced no increase in yield at the highest rate. Unlike other grain crops, oats seems to be fully tolerant to this chemical at 3 and 4 oz/A rates. None of the chemicals delayed maturity more than one day. All chemicals produced a high degree of weed control (78 to 97 pct) except the amine salt of MCP (58 to 39 pct). The higher yield increases were produced by the low volatile butoxy ethanol esters,and acetanilide of 2,4-D at the 3 and 4 oz. rates. Good increases were obtained with all treatments except ethyl ester "Dilute", which produced little or no increase. (Contribution from Agr. Div. American Chemical Paint Co., Saskatoon, Saskatchewan).

Effect of systemic herbicides on wheat treated at the two leaf stage, (Series 3), 1952. Pavlychenko T. K. Replicated plots of wheat (Triticum vulgare) were treated in the two leaf stage with 3, 4 and 5 oz/A rates of ethyl ester of 2,4-D, pentasyl ester of 2,4-low volatile butoxy ethanol ester of 2,4-D, emulsifiable acid of 2,4- and with 4, 6 and 8 oz/A rates of amine of 2,4-D (Weedar) and amine salt of MCP (Weedar MCP). The crop was growing on heavy clay soil, and was heavily infested with wild buckwheat (Polygonum convolvulus), cow cockle (Saponaria vaccaria) and wild mustard (Sinapsis arvensis). Growing conditions were favourable throught the season.
RESULTS: Wild mustard was practically eliminated by all treatments, but cow cockle and especially wild buckwheat, were only reduced to various degrees in vigor, stand and dry wt. but mostly survived the treatments. Of all chemicals used amine of 2,4-D (Weedar) gave the highest control of all weeds including strong stunting and reduction of dry wt (64, 58 and 67 pct.) in wild buckwheat. Butoxy ethanol ester was the next best (54, 63 and 66 pct.) followed by amine salt of MCP (Weedar MCP) (29, 38 and 49 pct.). The chemicals were less effective on wild buckwheat and cow cockle. Since no chemical gave complete control of the more resistant weeds in this experiment the yield increase was very slight, and, with one exception, uniformly present and rather consistently in proportion to the reduction in dry wt of wild buckwheat and cow cockle. (Contributed by Agr. Div., American Chemical Paint Company, Saskatoon, Sask.).

Effect of systemic herbicides on barley treated at the 4-leaf stage (Series 1 and 2) 1952. Pavlychenko, T. K. Replicated plots of 6-row barley were treated in the 4-leaf stage with 3, 4 and 5 oz/A of ethyl esters (standard and "Dilute"), low volatile butoxy ethanol esters of 2,4-D (standard and "Dilute"), pentasyl ester of 2,4-D, emulsifiable acid of 2,4-D, acetanilide of 2,4-D and amine salt of 2,4-D (ACP127). Acetanilide of 2,4-D was sprayed in 5 gal/A of Diesel oil, while the other chemicals were sprayed in the same quantit of water. Treatments were also applied at rates of 4, 6 and 8 oz/A of amine of 2,4-D (Weedar 64) and amine salt of MCP (Weedar MCP). The crop was heavily infested with wild mustard (Sinapsis arvensis), stinkweed (Thlaspi arvense) and Russian thistle (Salsola kali). The soil was clay loam and growing conditions were favourable throughout the season. RESULTS: None of the treatments affected significantly the stand, vigor, or height of grain. Only the 5 oz/A rates of butoxy ethanol ester "Dilute" and acetanilide of 2,4-D caused a delay in maturity of as much as 2 days. All of the other chemicals delayed maturity only one day or less. Except for the 6 oz rate of amine of 2,4-D (Weedar 64) which occasioned a 73 pct. destruction of the weeds, all treatments were highly effective, destroying 80 to 97 pct. the weeds and substantially increasing crop yields. Especially high weed reduction was effected by butoxy ethanol ester (standard) (93 to 97 pct.) and by amine salt of 2,4-D (ACP127) (94-98 pct.). (Contribution from Agr. Div. American Chemical Paint Co., Saskatoon, Saskatchewan.

Effect of systemic herbicides on barley treated at the three leaf stage, Series 3), 1952. Pavlychenko, T. K. Since barley is rather sensitiveto conventional grass killers (IPC, CIPC and TCA) a comprehensive project was used to determine the possibility of some 2,4-D materials for controlling Foxtail (Setaria sp.) in the crop. Replicated plots of barley (Hordeum vulgare) were treated in the three leaf stage with 3, 4 and 5 oz/A rates of ethyl ester of 2,4-D, pentasyl ester of 2,4-D, low volatile butoxy ethanol ester of 2,4-D, emulsifiabl

acid of 2,4-D, and with 4, 6 and 8 oz/A rates of amine of 2,4-D (Weedar) and amine salt of MCP. The crop was growing in sandy loam soil and was very heavily infested with green foxtail (Setaria viridis) which was just emerging at the time of treatment.

RESULTS: None of the treatments had any appreciable effect on the stand, vigor or height of the grain, and only one day delay in maturity was observed in the ethyl ester, low volatile butoxy ethanol ester and emulsifiable acid at 5 oz-A rates and in 8 oz/A rates of amine of 2,4-D (Weedar). Of all treatments used emulsifiable acid of 2,4-D gave the highest reduction in stand and dry wt of green foxtail and up to 28 pct. increase in crop yield. Amine of 2,4-D (Weedar) was next best with up to 51 pct. reduction in dry wt of the weed and increases in crop yield of 16, 18, and 7 pct. at the 4, 6 and 8 oz/A rates respectively. The remaining treatments all caused only slight injury to the weed and mostly economically insignificant increases in crop yields. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

Response of Nemaha oats to 2,4-D. Shafer, N. E., and D. W. Finnerty. Tests conducted during the past four years (1949 through 1952) indicate that significant reductions in yields of oats may result when 2,4-D is applied at an early stage of growth. Results are summarized below.

Table 1. Yields (Bu/A) of Nemaha oats treated at two stages of growth with two rates of 2,4-D ester and amine salt.

Material	Lb/A.	Jointing stage				Av.	Late boot stage				Av.	Av. both stag
		1949	1950	1951	1952		1949	1950	1951	1952		
Isopropyl ester	¼	18.5	12.3	47.1	34.1	28.0	29.2	31.6	49.0	37.0	36.7	32
Isopropyl ester	½	12.7	3.3	46.5	31.3	23.4	24.4	29.8	41.5	41.2	34.2	28
Triethanol amine	½	26.0	24.7	42.5	40.8	33.5	25.7	31.3	51.2	38.5	36.7	35
Triethanol amine	1	23.0	7.8	51.2	40.8	30.7	28.1	27.8	39.3	37.9	33.3	32
Check	0	27.2	32.3	43.2	33.8	34.1	24.8	28.9	48.6	37.3	34.9	34
Difference required for significance P = .05		8.4	5.0	15.0	8.8		8.4	5.0	15.0	8.8		

As shown in the table, ¼ and ½ lb isopropyl ester applied at the jointing stage resulted in serious yield reduction in two of four years. Amine salt at ½ and 1 lb resulted in similar reductions one year. As a result of these and other tests, it is recommended to Nebraska farmers that oats be not sprayed until after the jointing stage of growth. (Contributed by Nebraska Agricultural Experiment Station.)

Yield of Nemaha oats and seed production of wild buckwheat (Polygonum convolvulus) as affected by 2,4-D and MCP applied at tillering and jointing stages of oats. Finnerty, D. W. An area of Nemaha oats heavily infested with wild buckwheat was laid out in a split plot design. Buckwheat infestation averaged 30 plants per square foot in May preceding treatments. Tillering stage treatments were applied May 19. Oats were 4 to 6 inches high, with 4 to 6 leaves. Wild buckwheat was emerging to five leaf stage. Jointing stage treatments were applied May 30. Oats were 12 to 14 inches high, buckwheat plants had 2 to 24

leaves, with older plants beginning to vine. Results are presented in the table below.

Treatment	Lb/A	Tillering Stage Oats Bu/A	Tillering Stage Buckwheat seeds/100 gm oats	Joint Stage Oats Bu/A	Joint Stage Buckwheat seeds /100 gm oats.	Both Stages Ave. Oats bu.	Both Stages Weed seed/ 100 gm. Oats.
MCP amine	½	34.8	66	36.2	7	35.5	36
MCP amine	1	32.8	46	33.2	3	33.0	24
2,4-D amine	½	25.0	28	31.1	8	28.0	18
2,4-D amine	1	21.4	25	25.2	0.4	23.3	13
2,4-D ester	¼	19.0	54	26.6	20	22.8	37
2,4-D ester	½	12.0	52	20.2	2	16.1	27
Weedy check	-	33.2	666	32.1	277	32.6	472
Hand-weeded check	-	36.8	20	35.5	11	36.2	15
LSD.P -.05		5.4		5.4		4.0	

It is apparent from the table that MCP amine, while slightly less effective in weed suppression, was definitely less injurious to oats than were either 2,4-D amine or isopropyl ester. (Contribution from Nebraska Agricultural Experiment Station).

Effect of CMU in comparison to 2,4-D and MCP on wheat and barley Taylor, D. K. Treatments to replicated plots of wheat and barley included CMU at 1, 2 and 3 lb/A immediately following seeding, 2,4-D ester and MCP amine 8 oz/A two weeks after emergence. All applications were made in water at the rate of 100 gal/A. Good control of annual weeds was obtained at the 2 and 3 pound rates of CMU while the MCP and 2,4-D applications were relatively ineffective against such weeds as wild buckwheat (Polygonum convolvulus), lady's thumb (Polygonum persicaria), barnyard millet (Echinochloa crusgalli). CMU at 3 lb/A resulted in severe damage to the wheat while the 2 pound rate treatment gave a significant yield increase over the check. Barley appeared more tolerant to the 3 pound rate of CMU and although none of the treatments differed significantly from the check the 1 pound rate gave the highest yields. The post emergence treatments gave no significant increases in yield while reductions in yield were experienced from the 2,4-D ester on barley and the MCP amine on wheat treatments. (Contribution from the Dominion Experimental Farm, Agassiz, B. C.)

Controlling tartary buckwheat with 2,4-D. Wood, H. E., Craig, H.A. Hill, D. J. In northern Manitoba trials undertaken in 1951 to control Tartary Buckwheat, Fagopyrum tartaricum in cereal crops with 2,4-D butyl ester were repeated in 1952 on two farms. Application was made July 7 by knapsack sprayer to sq. rod plots of barley; in one field the barley 10" high, the buckwheat 3" to 6"; the other, barley 6", buckwheat 2" to 5". Three rates of chemical were used: 4, 8 and 16 oz. acid/A. Results: at 16 ounces all top growth of tartary buckwheat was held in check, with the majority of plants killed; at the lower rates growth was retarded but only a small percentage of plants were killed. These results are comparable with those of 1951. From these trials and from observations made on several farms in the area where farmers have been spraying to control tartary buckwheat, indications point to an application of 6 to 8 ounces of ester of 2,4-D as giving a measure of control. (Contribution of the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada).

Effect of two 2-4D esters on the yield of Victory oats and Argentine rape. Zalik, Saul. On June 18, 3, 6 and 12 ounces acid equiv./A of 2,4-D ethyl ester, and a low volatility ester were applied to plots of Victory oats (6 inches to leaf tip), and 1, 3 and 6 ounces were applied to Argentine rape (5 to 6 leaf stage). The yield of oats was based on threshed grain, and that of rape on harvest weight of plants prior to maturity. There was no significant difference between the yields of either crop attributable to formulation. The 6 and 12 ounce rates of both formulations reduced the yield of oats by statistically significant amounts. In the case of rape the yield reductions increased progressively as the rates increased, even the 1 ounce rate reducing the yield significantly. (Contributed by Department of Plant Science, University of Alberta, Edmonton).

Reaction of Exeter Oats to 2,4-D applied at different growth stages. Davidson, J. G. Exeter oats were treated with 4 and 8 ounces acid each of water sprays of standard amine and ester formulations of 2,4-D at twenty different growth stages. The stages were at three day intervals ranging from pre-emergence until the crop was fully headed. The results were erratic, caused perhaps by irregular germination and frequent rain showers throughout the treating period. However, in a general way the results tended to support roughly the findings of the previous year; that there is a period when the oats are vulnerable to 2,4-D treatment, commencing about two weeks after emergence and lasting for a period of about two weeks. This was apparent from the reduction in yield in the plots treated with 4 and 8 ounces of amine and 4 ounces of ester respectively. The plots treated with 8 ounces ester were most affected and showed reduced yields from the time they were sprayed at about eighty per cent emergence until they had almost reached the heading stage. (Contributed by the Dominion Experimental Farm, Indian Head, Sask.)

Control of weeds in small grains. Janzen, P. J. Wheat, oats, and barley were sprayed at 3 and 6-ounce rates of 2,4-D ester, M.C.P. sodium salt, and M.C.P. ester on June 18. The crops at that time were in the 4-leaf stage with a light infestation of Russian thistle (S. Kali), stinkweed (T. arvense), and redroot pigweed (A. retroflexus). Moisture conditions were good but the weather was cold and damp and remained so for the following week. 2,4-D ester controlled all three weeds at both rates. M.C.P. sodium salt controlled stinkweed and some redroot pigweed at 3 ounces and all the redroot pigweed at 6 ounces. M.C.P. ester controlled stinkweed and redroot pigweed at both rates. Both formulations of M.C.P. failed to control Russian thistle, even at the 6-ounce rate. With the light infestation of weeds, no significant yield increases of grain were obtained. However, 2,4-D ester reduced the yield of oats by about 10 per cent with the 3-ounce rate and by 50 per cent with the 6-ounce rate, and barley showed a slight decrease at the 3-ounce rate and about 20 per cent at the 6-ounce rate. Formulations of M.C.P. showed no significant difference in yield of these crops at either rate. No significant differences in yields of wheat were obtained from any of the chemicals at the two rates used. Another portion of the same fields was sprayed a week later with 8 ounces of 2,4-D ester. The weather was warmer and good weed control was obtained. This later spraying did not reduce the yield of either oats or barley. It appears, therefore, that temperature at the time of spraying and afterwards may have an important influence on the effect of the chemicals on crops. (Contribution of the Dominion Experimental Station, Swift Current, Sask.)

WEED CONTROL IN FALL SOWN GRAIN

Summary

W. M. Phillips

Only two abstracts concerning this subject were received. One report gave results of a wild garlic control experiment in winter barley, the other subject was the effect of 2,4-D on winter wheat. The small number of abstracts received would seem to indicate that this phase of weed control has become rather standardized throughout the region.

Bulblet formation of wild garlic was effectively reduced by applications of 0.5, 1.0, and 1.5 lbs. of 2,4-D ester per acre when applied before the barley jointed. Treatment in the boot stage was not effective. The two higher rates reduced barley yields when applied during the boot stage.

Winter wheat yields were reduced when 1 lb. of 2,4-D ester per acre was applied during the pollinating period.

Abstracts of Results of Cooperators

Control of wild garlic in winter barley with 2,4-D. Hansen, J. R. and J. F. Freeman. The butoxy ethanol ester of 2,4-D was used at rates of 0, 0.5, 1.0, and 1.5 lb/A and applied on March 20, April 8, and April 30, 1952. Temperatures on the three dates were 76°, 60°, and 81° F. and weather was clear on all dates. On the earlier dates, barley had not begun to joint, but was in the boot stage on April 30. Garlic head primordia were visible by the latter date. Mean barley yields for all dates were 33, 33, 31, and 29 bu/A for the 0, 0.5, 1.0, and 1.5 rates with the two higher rates reducing yields at the last treatment date. Treatments on the two earlier dates effectively reduced bulblet formation. The last series of sprays had little or no effect on garlic. Untreated plots yielded 218 lb/A of garlic bulblets, which caused heating and grain spoilage. Sprays on the first two dates were similar in effect. Average garlic yields for these treatments were 161, 21, and 14 lb/A for 0.5, 1, and 1.5 lb rates. (Kentucky Agricultural Experiment Station)

The yield of hard red winter wheat as affected by the date of application of 2,4-D. Phillips, W. M. Winter wheat was sprayed at 18 different dates with 1 pound of 2,4-D ester per acre. The yields obtained were rather variable but there appeared to be one period in which the yields were considerably reduced. The no treatment plots gave an average yield of 36.3 bushels per acre. Plots treated on May 19 through May 23 gave the following yields: May 19, 36.9; May 20, 35.6; May 21, 30.9; May 22, 28.9; and May 23, 32.7 bushels per acre. Weather conditions made it impossible to spray for the following 4 days, and by May 28 the yields were apparently back to normal. This would appear to indicate that the time during which wheat may be damaged is a relatively short period, but if sprayed during this period damage is likely to occur. On May 20 through May 23, the wheat was in the process of pollination and it is believed that it is during this period that the wheat is most susceptible to damage from 2,4-D. Applications made prior to the above mentioned stage of growth and after the wheat had passed the pollination period appeared to cause no reduction in wheat yields. Test weight of all the treated grain appeared to be normal. (Contributed by Division of Weed Investigations BPISAE, Hays, Kansas)

FLAX

Summary

R. G. Robinson

Eight abstracts dealt with the use of TCA on flax. Annual grass weeds other than wild oats were generally controlled by rates of about 5 lb/A applied when the flax was 2 to 6 in. tall. Applications in either 2, 4, 8 or 16 gal. of water/A gave satisfactory grass control. This abstract indicated that there might have been relatively more flax injury at the 2 gal. volume although the yield data do not definitely confirm it.

TCA in mixture with either 2,4-D or MCP was reported to control both susceptible grass and non-grass weeds in flax with one spraying.

Applications at time of flax emergence involving TCA rates of 10, 15 or 20 lb/A reduced both stand and yield of flax according to one abstract. Pre-emergence applications of 5, 10 or 20 lb/A to fibre flax gave good control of green foxtail but seriously decreased seed, straw, and fibre yields.

Pavlychenko and Bestrop compared several formulations of 2,4-D on flax and weeds. They also compared MCP and 2,4-D amine salts on flax; MCP gave larger increases in flax yield. Coupland reported that MCP appeared to have no advantage over 2,4-D in treatment of flax at the recommended stages. He also reported that MCP butyl ester at 1/2 lb/A gave good control of Russian thistle in flax.

Burrows and Olson reported the effect of various numbers of wild mustard plants in flax and the effect of their removal with 2,4-D.

Pre-emergence use of CMU on flax was reported in 3 abstracts. Rates of 1 to 2 lb/A appeared promising. Post-emergence use of CMU was reported in 2 abstracts: One stated that 1 to 2 lb/A gave good control of wild oats with only slight reduction in flax yield; whereas the other reported no control of green foxtail or other weeds at rates up to 3 lb/A.

Use of CIPC was reported in 3 abstracts. One abstract indicated that 1 1/2 lb/A post-emergence gave no weed control; whereas another reported 5 lb/A killed flax and weeds. Pre-emergence applications of 5 lb/A or 2, 4, or 6 lb/A at time of emergence seriously injured flax. IPC applied at time of emergence reduced the stand and yield of flax and gave no control of broadleaf weeds.

Endothal at rates of 1/2, 1, 2, or 4 lb/A on flax 1 to 3 in. tall seriously reduced the yield of flax but also reduced the stand of wild oats 50% or more.

MH at 8 lb/A pre-emergence killed broadleaf weeds but did not injure flax or grass weeds. A second application post-emergence killed all growth back to the ground line.

Abstracts of Results of Cooperators.

The effect of various herbicides upon Marine flax at Kanawha, Iowa. Bakke, A. L. and D. W. Staniforth. Marine flax seeded on April 18 was given a pre-emergence treatment of CMU at the rates of one and two lbs. per acre with respective yields of 8.4 and 8.1 bu/A. The same variety of the flax with no cultivation yields 5.9 bu/A. Several herbicides were used in the post-emergence treatment on April 24 when the flax was 5-6 inches tall, weeds 2-5 leaves. Plots treated with ethyl ester, 2,4-D at rates of 1/4 lb/A yielded 5.7 bu/A; with MCP (amine) at 1/4 lb., 5.8 bu/A; with TCA sodium salt at 8 lb/A, 5.8 bu/A; and with TCA sodium salt (8 lbs.) plus 2,4-D ester 1/4 lb., 8.2 bu/A. Where there was no cultivation, the yield was 5.9 bu/A; where the plots were hand weeded, the yield was 16.7 bu/A. Plots where the grass weeds were allowed to grow yielded 6.4 bu/A. With the smartweed Polygonum pennsylvanicum removed, the yield was 8.3 bu/A, indicating that a broad-leaved weed like the Pennsylvania smartweed is a more vigorous competitor than grasses. The least significant difference was 1.5 bu/A. The plots treated with a combination of 8 lb. TCA and 1/4 lb. MCP amine had the smallest amount of weeds at time of harvest on July 31. (Contribution from the Botany and Plant Pathology Department, Iowa Agricultural Experiment Station.)

Herbicidal control of annual weeds in flax. Brown, D. A. Treatments and rates per acre (1) TCA 8 lb. salt (2) TCA 5 lb. plus MCP amine salt 5 oz., (3) MCP amine salt 5 oz., (4) CMU 2 lb. active ingredient (5) CIPC 5 lb. active ingredient, (6) MH 8 lb. active ingredient, (7) 2,4-D fortified dust 5 lb. All treatments excepting MCP alone and fortified dust, were applied two days before flax and weeds emerged. Flax was a poor stand. Wild millet, stinkweed, wild oats, and pigweeds were thick. Response from all treatments was disappointing and fourteen days after first treatment, half the plots were used for a second treatment, the flax then being 2 to 4 inches tall and weeds in late seedling stage. Ten days later, notes were taken.

Results: Once treated pre-emergence. TCA 8 lb., 90% kill millet, few other weeds injured, no effect on flax. CMU 2 lb., 80% kill millet, 20% other weeds, slight injury to flax. CIPC 5 lb., severely inhibited all growth. MH 8 lb. inhibited broad leaved weeds, no injury to grass weeds and flax. Twice treated: TCA killed all millet, no injury to other weeds and flax. TCA plus MCP, thorough kill all weeds except wild oats. No injury to flax. CMU killed all weed growth. Severely injured flax. CIPC inhibited all growth including flax. MH killed all growth back to ground line. Combination TCA - MCP amine salt, only satisfactory treatment. Flax plots were useless for yield purposes hence were plowed down and re-seeded to flax July 22 to study residual effect of chemicals. TCA at all rates gave strong toxic effect and either killed or severely stunted second crop. CMU at 2 lb, stimulated second crop flax. At 4 lb., thinned stand severely. CIPC at both rates acted as a strong fertilizer on second crop producing very heavy tall growth. MH at both 5 and 10 lb. rate also stimulated second crop. (Contributed by Experimental Farm, Brandon, Manitoba, Canada.)

The effect of TCA and TCA in combination with 2,4-D amine (mixed) on Setaria viridis, Brassica arvensis, Chenopodium album and Dakota flax, 1952. Burrows, V. D. and P. J. Olson. Seeds of Setaria viridis, Brassica arvensis and Chenopodium album were mixed with flax and sown at the rate of 45 lb/A. Excellent and uniform stands of Setaria viridis and flax were obtained but those of Brassica arvensis and Chenopodium album were poor. The experimental design was a 5 x 5 latin square. The five treatments were: 0, 5, 8 lb. of TCA (active ingredient)/A, 5 lb. of TCA (active) in combination with 3 and 5 oz. (acid equivalent) of 2,4-D amine.

Treatments were applied when the flax was 2-3 in. in height and the Setaria viridis in the 1-2 leaf stage. There was good to excellent control of Setaria viridis in all treated plots and the addition of 2,4-D amine to the spraying mixture removed the broad-leaved weeds. There was no visible evidence of damage or delay in maturity as a result of treatment with TCA. Yields of Setaria viridis in lbs/A and flax in bu/A are presented.

	Check	5 lb. TCA	8 lb. TCA	3 oz. 2,4-D & 5 lb. TCA	5 oz. 2,4-D & 5 lb. TCA
Setaria viridis	2895	169	Nil	382	358
Flax	17.02	24.01	26.29	26.29	26.80

L.S.D. (Flax) - - - 4.10 bu.

The difference in yield of flax between the check and any other treatment is significant at the 1% level. All treatments resulted in an increased yield of flax. (Contribution from the Division of Plant Science, The University of Manitoba, Winnipeg.)

The effect on Dakota flax of various concentrations of mustard plants (Brassica arvensis) and of their removal by 2,4-D butyl ester. 1952. Burrows, V. D. and P. J. Olson. Mustard concentrations of 0, 10, 25, 50, 100, 200 and 400 plants/sq. yd. were established in plots simultaneously sown to flax at 45 lb/A (4 replications). The various concentrations established in blocks were obtained by careful counting at the time of their emergence. Excellent stands of both weeds and crop were obtained. The blocks were divided into treated and untreated halves. 2,4-D butyl ester was applied at the rate of 4 oz. acid equivalent/A when the flax was 2-3 in. in height and the mustard in the 4-5 true leaf stage (2 1/2 - 4 in.). Excellent control was obtained. The treated plots were delayed in maturity 1-2 days. There were no significant differences in the number of flax plants per plot but as the concentrations of mustard plants increased the number of main branches per plot, number of seed bolls per plant, straw yields and seed yields decreased significantly. Generally, treatment significantly increased the number of branches, bolls, straw weights and yield. The yields in bu/A: Treated (0) 19.35, (10) 17.71, (25) 17.06, (50) 16.62, (100) 15.31, (200) 13.67, (400) 11.62. Untreated: (0) 22.04, (10) 8.14, (25) 6.24, (50) 5.86, (100) 3.61, (200) 3.20, (400) 1.74. The yield of the treated check is significantly lower than that of the untreated. The reduction in yield of treated plots with increased weed concentration is notable. Evidently branching at the base was reduced by the weeds present before treatment. The number of bolls per plant accounts for the vast difference in yield between the treated and untreated plots. Yield of dry weeds per plot showed that 25 weeds produced approximately as much dry matter as 50, 100, 200 and 400 weeds. (Contribution, Division of Plant Science, University of Manitoba, Winnipeg.)

Residual pre-emergence treatment of fibre flax with TCA - 1951. Chubb, W.O. and E. M. MacKey. TCA, sodium salt, was applied as a spray in 80 gal. (U.S.) total spray liquid per acre to plots of Liral Dominion flax immediately after sowing. Rates of application were 0, 5, 10 and 20 lb. acid equivalent per acre. Treatments were replicated 3 times. Plot size was 1/160 acre. Fibre yields were obtained by processing of anaerobic water retted straw over mill scale fibre flax machinery. Although good control of green foxtail was obtained, significant reductions were observed in flax straw length and stand, yields of cleaned seed, de-seeded straw, total fibre, line fibre and line fabre as percent of total fibre and both length and "quality" of hand dressed line fibre. The yield of total fibre as percent de-seeded straw, seed oil content and oil iodine number were not significantly affected. The figures for some of these values, in the order of check; 5 lb., 10 lb., and 20 lb. treatments were: green foxtail, per quadrat area,

155, 12, 2, 0; flax stand, per yard of row, 254, 216, 192, 131; yield of cleaned seed (bu/A) 16.1, 13.2, 11.6, 8.6; yield of de-seeded straw (lb/A) 4640, 3600, 3360, 2560; yield of total fibre (lb/A) 646, 501, 437, 321; yield of line fibre (lb/A) 173, 130, 42, 14; yield line as % total fibre 27%, 26%, 9%, 4%; length of hand dressed fibre (in.) 27, 25, 22, 19. (Contribution of the Dominion Pilot Flax Mill, Experimental Farms Service, Portage la Prairie, Manitoba.)

Relative effect of 2,4-D and MCP on flax, 1952. Coupland, R. T. Royal flax was planted in 7 rod-row plots (6 in. between rows) in randomized blocks at Saskatoon on May 10. The plots were kept free of conspicuous weeds by hand pulling. MCP and 2,4-D were applied at 4 and 8 oz/A in the amine and butyl ester form. Treatment was made in three stages to quadruplicated plots in 7.1 Imperial gal. of water/A. The stages were: June 6 - 15 to 20 leaves, 2 to 2.5 in. high; June 27 - 5 to 7 in. high; July 19 - in flower. The yield of flax was decreased least by the second stage of treatments in which the reduction averaged 11 to 1% (mean 7%) below the checks. Comparative data for the first stage were 19 to 0% (mean 8%) below checks and for the third stage 30 to 0% (mean 16%). MCP treated plots did not yield appreciably higher than 2,4-D plots except from treatment in the third (flowering) stage, and then only the ester treatments were significantly increased (by 29 and 30%, respectively, in the 4- and 8-oz. treatments). The 8 oz. rate of amine of either herbicide did not reduce the yield below the 4 oz. rate. In the case of the ester, the heavier rate caused a reduction (in 17 comparisons out of 23) averaging 10% for 2,4-D and 8% for MCP. Height of flax was not affected by any treatment. Date of maturity was delayed only by the treatments at flowering time. 2,4-D delayed maturity an average of 8 to 14 days while MCP delayed it about one day less. On the basis of this work, MCP appears to have no advantage of 2,4-D in treatment of flax at the recommended stages. (Contribution from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

Effect of MCP on control of Russian thistle (Salsola pestifer A. Nels.) in flax, 1952. Coupland, R. T. Royal flax was planted in 7 rod-row plots (6 in. between rows) in randomized blocks at Saskatoon on May 10. Four quadruplicated treatments were applied: Flax kept weed free, volunteer weeds treated with MCP, weeds seeded between rows untreated, and weeds seeded and treated with MCP. MCP was applied at 8 oz/A as a butyl ester in 7.1 Imperial gal. of water at three stages. The weed involved was Russian thistle. The stages were: June 6, flax 2 in., weed 2 in.; June 27, flax 6 in., weed 6 in.; July 19, flax in flower. The herbicide was not effective in reducing the density of the densely seeded weed. The number of weeds in untreated plots averaged 106 per 0.92 sq. yd. at harvest. The stand was reduced by 4, 10 and 0%, respectively, by the first, second and third treatments. Air-dry weights of aboveground parts of weeds was not reduced by treatment. Vigor of the weed was slightly reduced, the height at harvest averaging 22, 23 and 20 in. in the three treatments, respectively, compared to the untreated weeds which were 24 in. The yield of flax seed was increased by the herbicidal treatment in the first and second stages, respectively, by 9 and 28%. The third treatment (flowering) resulted in a 2% increase in yield. Weed control was good from MCP treatment of volunteer stands (at harvest an average of 3 plants per 0.92 sq. yd. yielding 19 gm. of air-dry aboveground parts). Yield of flax was approximately three times that from the very weedy MCP treated plots, but was 9, 12 and 29% below the weeded untreated plots, respectively, from the first, second and third treatments. The heights of weeds in treated plots were 8, 11 and 13 in., respectively. (Contribution from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

Use of TCA and other chemicals to control green foxtail in flax. Craig, H. A., W. H. Silversides and H. E. Wood. At seven locations across the main flax growing area of Manitoba, a series of nine one-tenth acre plots of flax, heavily infested with green foxtail Setaria viridis were boom-sprayed, using water at the rate of 5 Imperial gallons per acre as follows: 3 plots, with 5, 10 and 15 lbs. TCA acid /A respectively (amount actually applied ranged between 4 and 18 lbs.); 1 plot TCA 7 1/2 lbs. and 2,4-D amine 7 1/2 oz.; 1 plot TCA 7 1/2 lbs. and MCP sodium salt 7 1/2 oz.; 3 plots, 12, 24, and 48 oz. CMU.; one plot CIPC 1 1/2 lbs. Application was on June 11-13th when the flax was emerging to 3" high, the foxtail likewise, but mostly in two-leaf stage. Various other weed species were present differing at each location, also at one location considerable volunteer wheat. Almost 100% control of green foxtail was obtained at all locations on all plots receiving TCA, with the heavier dosages giving complete control. Where 2,4-D or MCP was used with TCA, almost complete control of broad-leafed weeds was obtained. A noticeable reduction in stand of wild oats was noted on TCA treated plots, likewise for the volunteer wheat. CMU and CIPC at above rates gave no control of green foxtail or other weed species. Soon after application, while some retardation was noted on the plots receiving the addition of 2,4-D and MCP this was difficult to detect as the season advanced. Although yields were not determined, indications pointed to increases at most locations. (Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada.)

Post-emergence application of TCA for control of annual grasses in flax in 1952 at 3 locations, one each in N. Dak., S. Dak., and Minnesota. MacDonald, W. P., C. C. Zinter and A. T. Slough. 90% sodium TCA was applied at 4.28 lb. acid equiv. per acre with water to equal 2, 4, 8 and 16 gallons of solution per acre at 3 locations. Flax was 2 to 5 inches in height; grasses (mostly Setaria spp.) 1 to 3 inches. Plots were triplicated and randomized. Grass control satisfactory at all rates of water. Visual observations seemed to indicate a greater tendency for injury at lower rates of water, specifically the 2 gal./A rate; however, after study of yield data, it was difficult to draw definite conclusions to that effect. No differences were observed in the reactions of Sheyenne, Royal and Minerva flax. (Contribution of Agr. Dept., F. H. Peavey & Co., Minneapolis, Minn.)

Post-emergence application of TCA and systemic chemicals to control grasses and annual broadleaf weeds in flax at 3 locations, one each in N. Dak., S. Dak., and Minnesota. MacDonald, W. P., C. C. Zinter and A. T. Slough. 90% sodium TCA at 4.28 lb. acid equiv. per acre along with 3 and 4 oz. acid equiv. of amine MCP and alkanolamine, 2,4-D (each used singly with TCA) were applied as a mix along with water to equal 4 gals. of solution per acre. Same chemicals applied alone at equiv. rates. Plots triplicated and randomized. Flax 2 to 5 inches, grasses and broadleaves 1 to 3 inches. Control of Setaria spp. and broadleaved weeds was satisfactory in all plots. On some plots there was appreciable but erratic and unsatisfactory control of wild oats. No differences were observed in the reactions of Sheyenne, Royal, and Minerva flax. Visual observation and study of yield data indicate that TCA, MCP, and 2,4-D applied alone caused less injury to flax than as a combination of TCA and MCP or 2,4-D; however, yield data indicated in most cases an increase in yield over that of untreated check plots. The data would suggest that when TCA is applied with 2,4-D or MCP the lowest recommended per acre rate of each of the chemicals should be used. (Contribution of Agr. Dept., F.H. Peavey & Co., Minneapolis, Minn.)

Post-emergence application of CMU at two locations, one each in N. Dak., and Minnesota to control wild oats in flax. MacDonald, W. P., C. C. Zinter and A. T. Slough. 3-P-Chloro-phenyl - 1 - 1 - dimethylurea (CMU) was applied at 8, 4, 2 and 1 lb. active ingredient per acre with 35 gallons of water at two locations as a selective post-emergence spray for wild oats in flax. Wild oats 2 to 4 inches high; flax 1 to 3 inches. Plots were triplicated and randomized. The 4 and 8 lb. rates seriously reduced flax stand and maturity, while the 2 and 1 lb. rates delayed maturity and reduced yield only slightly. Better than 90% control of wild oats was obtained at the 8, 4 and 2 lb. rates, with 75% control at the 1 lb. rate. (Contribution of Agr. Dept., F. H. Peavey & Co., Minneapolis, Minn.)

Post-emergence application of Endothal in 1952 at 2 locations, one each in N. Dak. and Minnesota to control wild oats in flax. MacDonald, W. P., C. C. Zinter and A. T. Slough. 3,6-endoxohexahydrophthalate (Endothal) was applied at 4, 2, 1 and 1/2 lbs. active ingredient per acre with four gallons of water at 2 locations as a selective post-emergence spray for wild oats control in flax. Wild oats 2 to 4 inches high, flax 1 to 3 inches. Plots were triplicated and randomized. All rates reduced wild oats stands at least 50% with delay in maturity and stand of flax and serious reduction in yield compared to checks. (Contribution of Agr. Dept., F. H. Peavey & Co., Minneapolis, Minn.)

Effect of systemic herbicides on flax, treated at the 3 to 5 leaf stage, 1952. Pavlychenko, T. K. and A. J. Bestrop. Triplicated plots of flax (Linum usitatissimum) were treated at the 3 to 5 leaf stage with 3, 4, and 5 oz/A rates of ethyl esters (Weedone Concentrate and Weedone Concentrate "Dilute"), butoxy ethanol esters (Weedone LV4 and Weedone LV4 "Dilute") and amine salt (Weedar 64) of 2,4-D, and amine salt of MCP (Weedar MCP). The flax was growing on clay loam soil very heavily infested with Russian thistle (Salsola kali), stinkweed (Thlaspi arvense) and wild mustard (Sinapis arvensis). Growing conditions were favorable throughout the season.

RESULTS: All the treatments were highly effective in controlling the 3 weeds and every treatment, excepting Weedone Concentrate "Dilute" at 5 oz/A. produced substantial increases in crop yields. None of the treatments depressed appreciably the height or vigor of flax, but ripening was delayed by all treatments, ranging from one day with Weedar MCP 3 oz/A to four days with Weedone LV4 "Dilute" 5 oz/A. The consistently high yield increases of 4.3, 8.3, 8.9 bu/A were obtained from LV4 plots at the 3, 4 and 5 oz/A rates. MCP amine with 9, 5.3 and 2.9 bu/A was the next best, followed by Weedar 64, with increases of 1.0, 4.3 and 5.4 bu/A., Weedone Concentrate with 2.1, 7.8 and 1.6 bu/A, Weedone Concentrate with 6.0, 4.5 and -1.2 bu/A and LV4 "Dilute" with .3, - .6 and 6.0 bu/A at the 3, 4 and 5 oz/A rates. Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.

Effect of systemic herbicides on flax, treated at the 7 to 8 leaf stage, 1952. Pavlychenko, T. K. and A. J. Bestrop. Triplicated plots of flax (Linum usitatissimum) were treated at the 7 to 8 leaf stage with 3, 4 and 5 oz/A rates of ethyl esters (Weedone Concentrate and Weedone Concentrate "Dilute"), butoxy ethanol esters (Weedone LV4 and Weedone LV4 "Dilute") and amine salt (Weedar 64) of 2,4-D, and amine of MCP (Weedar MCP). The flax was growing on clay loam soil very heavily infested with Russian thistle (Salsola kali), stinkweed (Thlaspi arvense) and wild mustard (Sinapis arvensis). Growing conditions were favorable.

RESULTS: Compared with the weedy checks, all treated plots showed very considerable increases in the stand, vigor and yield of the flax. The maturity was delayed not more than one day by any of the treatments. Weedone Concentrate caused reductions of 64, 74 and 73% in the dry wt. of weeds and increased crop yields by 200, 173 and 195% at the 3, 4 and 5 oz/A rates respectively. Corresponding figures for Weedone Concentrate "Dilute" were 62, 67 and 79%, and 99, 147 and 147%. Weedone LV4 caused reductions of 84, 62 and 73% in the dry wt. of weeds, with attendant crop yield increases of 100, 152 and 49% at these three rates. Corresponding figures for Weedone LV4 "Dilute" were 86, 94 and 86%, and 175, 186 and 300%. Weedar 64 caused reductions of 79, 54 and 77% in the dry wt. of weeds with flax yield increases of 136, 98 and 211% at the three respective rates. Weedar MCP caused reductions of 52, 66 and 68% in the dry wt. of weeds, with attendant flax yield increases of 148, 219 and 114%. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.

Effect of treatments with IPC, Chloro IPC and TCA on flax. at the time of emergence, 1952. Pavlychenko, T. K. and A. J. Bestrop. Triplicated plots of flax (Linum usitatissimum) were treated at emergence with 2,4 and 6 lb/A rates of isopropyl-n-phenyl carbamate (IPC), isopropyl-n-(3-chlorophenyl) carbamate (CIPC), and with 10, 15 and 20 lb/A rates of sodium trichloroacetate (NaTCA). The flax was growing on clay loam soil very heavily infested with Russian thistle (Salsola kali), stinkweed (Thlaspi arvense) and wild mustard (Sinapis arvensis). Growing conditions were favorable throughout the season.

RESULTS: None of the treatments produced an agronomically significant control of the broadleaved weeds present. IPC treatments have reduced the stand of the crop by 16, 22 and 32% and vigor by 6, 10 and 11%, at the 2, 4, and 6 lb/A rates respectively. Chloro IPC was much more severe than IPC on flax. Reductions in stand were 94, 94 and 99%, in vigor 79, 80 and 89%, and in the height 1, 5 and 11 in. Serious delays of 9, 9 and 10 days in ripening occurred. The yield was reduced by 70, 79 and 92% at the three respective rates. TCA treatments caused reductions of 9, 19 and 26% in the stand and 1, 6 and 6 % in the vigor but no significant effect on the height or the time of ripening was observed at the 10, 15 and 20 lb/A rates of the crop. Yield reductions of 7, 24, and 10% occurred at the three respective rates. The three chemicals failed to give a satisfactory control of the broadleaved weeds present and have caused 7 to 92% reduction in the crop yields. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.

Effect of CMU, 2,4-D and MCP on flax. Taylor, D. K. Treatments to replicated plots of flax included CMU at 1, 2, and 3 lb/A immediately following seeding, 2,4-D ester and MCP amine 8 oz/A two weeks after emergence. All treatments were diluted in water and applied at 100 gal/A. Good control of annual weeds were obtained at the higher rates of CMU while even the one pound rate gave fair control. The 2,4-D and MCP treatments were ineffective against such weeds as wild buckwheat (polygonum convolvulus) lady's thumb (Polygonum persicaria) and barnyard grass (Echinochloa crusgalli). Some reduction in stand of flax was evident in the CMU 3 lb/A treatment while all herbicide treatments caused a delay in maturity. The CMU 1, 2, and 3 lb. treatments yielded as follows: 23.6, 18.0 and 18.0 bu/A as compared to 18.9 bu/A for the check. With a significant increase over the check the CMU 1 lb/A treatment was most promising. While the 2,4-D ester at 8 oz/A resulted in a significant decrease in yield (13.7 bu/A), the flax was more tolerant to the MCP amine treatment (19.5 bu/A). (Contribution from the Dominion Experimental Farm, Agassiz, B. C.)

Summary C. J. Willard

Nine abstracts from eight stations describing work with herbicides on corn have been received. Three of these were primarily concerned with 2,4-D. One was concerned entirely with cultural methods. The others were concerned with various newer herbicides on corn, three of them including pre-emergence 2,4-D in comparison. The work with 2,4-D added nothing new to our recommendations for the use of that chemical, so that there is no occasion to change previous recommendations. DNOSBP gave good results when the timing was right - the right time being just before or as the corn was coming through. Rates from 7 to 12 pounds are suggested by limited data from four Stations. CMU was tested at five Stations. It damaged corn rather generally at rates above 2 pounds. It usually gave good weed control at that rate, but not always, and it sometimes injured corn at that rate. CIPC injured corn at 4 and 8 pounds in one test; did not injure it at 6 pounds in another. SES seemed promising. Endothal 3003 did not. The cultural experiment and some of the tests with chemicals indicated that in a dry season even light weed infestations caused severe damage.

Abstracts of Results of Cooperators

Effect of chemical weed control upon yields of corn, 1949-1952.

Churchill, B. R. and Grigsby, B. H.

Table 1. Corn yields for 1949 and 1950 from various treatments.

Treatment	Bu./A.
Check, (3 cultivations)	63.8
Check, plus 1 hoeing after last cultivation	77.0
Post-emergence 2,4-D, ½#/A - no cultivation	25.6
Post-emergence 2,4-D, ½#/A plus 2 cultivations	56.0
Pre-emergence 2,4-D, 2#/A - no cultivations	30.3
Pre-emergence 2,4-D, 2#/A plus 2 cultivations	67.0

Table 2. Corn yields in 1951 from various treatments.

Treatment	Bu./A.
Check,(3 cultivations)	67.9
Check, plus 1 hoeing	72.9
Check, plus TCA 5#/A after last cultivation	65.6
Post-emergence 2,4-D, ½#/A plus 2 cultivations	69.6
Pre-emergence 2,4-D, 2#/A plus 2 cultivations	71.1
Cyanamide 300#/A plus 2 cultivations	65.9
Ammonium sulfate 300#/A plus 2 cultivations	48.1

In 1952 treatments included (1) check (3 cultivations) (2) check plus 1 hoeing, (3) check plus TCA 5#/A, (4) post-emergence 2,4-D ½#/A plus 2 cultivations (5) 2 cultivations followed by post-emergence 2,4-D 1#/A, (6) pre-emergence 2,4-D 1#/A plus cultivations (7) pre-emergence MCP 1#/A followed by 2 cultivations. No treatment except hoeing gave satisfactory weed control in 1952. Yields have not been calculated. (Contribution from the Michigan Agricultural Experimwnt Station, East Lansing, Michigan.)

Response of corn to pre-emergence, emergence, and post-emergence applications of CMU, DNOSBP and CIPC. Hamilton, K. C., and Buchholtz, K. P. Wisconsin hybrid 416AA corn was planted May 25 on a Miami silt loam soil previously sown to rape, millet and ryegrass to assure abundant weedy growth. The plots containing alternate rows of corn, soybeans, and a blank, spaced 30 inches apart, were replicated four times in a randomized complete block design. Both cultivated and uncultivated checks were included. CMU at 1 and 2 lbs., CIPC at 4 and 8 lbs., and DNOSBP at 6 and 12 lbs. per acre were applied in water equivalent to 40 gal. per acre. The first series was applied on May 26, the day following planting; the second during emergence, June 5; and the third post-emergence, June 12. No cultivations were made except on cultivated checks. The only treatment reducing corn stand significantly was the post-emergence 12 lb. application of DNOSBP. The following table contains the data on corn yield and weed stand obtained June 27.

Observation	Date	CMU		CIPC		DNOSBP		Check
		1 lb.	2 lb.	4 lb.	8 lb.	6 lb.	12 lb.	
Grassy weeds	1	75*	28*	316*	183*	479*	165*	uncult.
Plants/8 sq.ft.	2	88*	26*	440*	353	170*	35*	673
	3	187*	38*	394*	479*	25*	3*	
B-leaved weeds	1	4*	1*	49*	45*	7*	3*	uncult.
Plants/8 sq.ft.	2	5*	1*	70	53*	11*	2*	111
	3	6*	3*	79	59*	0*	1*	
Corn	1	65.5	70.0	26.3*	29.8*	29.0*	55.0	cult.
Yield	2	73.2	53.4	6.5*	26.6*	49.8*	62.8	60.8
bu./acre	3	38.8*	56.0	12.2*	15.6*	49.9	30.4*	

The yield figures are low as the yield was calculated on the basis of a 7.5 foot row spacing. The average CMU and DNOSBP treatments were significantly better than those of CIPC in controlling both grasses and broadleaves, while all dates of applications gave equal control. The average yield for dates of application did not differ significantly, although the post-emergence applications often delayed maturity. (Department of Agronomy, University of Wisconsin, Madison, Wisconsin.)

A comparison of hilled and drilled corn with different cultural methods of weed control. Hansen, J. R. and J. F. Freeman. Ky 102 yellow dent corn was planted in a silty clay loam soil on May 12, 1952. Each of four replicates contained five whole plots to which different cultural treatments were applied: two cultivations, two cultivations with clean hoeing, one early cultivation plus clean hoeing, one late cultivation plus clean hoeing, and clean hoeing. Cultivation was one-way with a shovel cultivator. Each treatment plot contained two 1/100 A subplots, 4 rows, with corn planted in 3 x 3.5 ft. spaced hills, three kernels per hill, or kernels planted 1 ft apart in rows spaced 3.5 ft wide. Weather was cool and moist following planting in May so that corn and weeds grew off slowly. Cultivation dates were June 10 and June 30, and plots were hoed on those dates and late in July. Throughout much of the season corn was under some moisture stress, especially during time ears were forming. There were no significant differences in yield between hilled and drilled corn with any of the treatments. Mean yields over all treatments were 39.6 and 40.8 bu/A for hilled and drilled corn. Yields from plots receiving two cultivations but no hoeing were significantly lower than all other treatments. While weed populations in rows of these plots were not heavy, they reduced yields by 40% indicating need for complete weed control in dry seasons on upland soils. (Kentucky Agricultural Experiment Station.)

Combinations of pre-emergence herbicides on corn. Hansen, J. R. and Freeman, J. F. Ky 102 corn was planted on May 13, 1952 and herbicides were applied on May 17 on silty clay loam soil with cloddy surface. Treatments included CIPC, 0 and 2 lb/A; isopropyl ester of 2,4-D, 0 and 1.5 lb/A; amine salt of DNOSBP and amine salt of MH, each at 0 and 6 lb/A. Treatments were applied in factorial combinations in randomized complete blocks. About 1 in. of rain fell after planting but before spraying, and 1.5 in. fell during the week following applications. The summer was dry and better treatments gave good weed control for the entire season. No injury to corn by any one or combinations of herbicides was detected. Analysis of weed counts indicated significant reduction by all materials, although MH gave poor control. First order interactions except 2,4-D x MH and DNOSBP x MH were significant. Corn yields were low because of dry weather and heavy planting rate on droughty soil. Only 2,4-D and CIPC increased yields significantly. DNOSBP approached significance and MH had very little effect on yield. In general, the combination of two or more herbicides gave better control of both broadleaved weeds and grasses than any one alone. (Kentucky Agricultural Experiment Station.)

Pre-emergence and post-emergence 2,4-D on corn. Ilnicki, Richard D. and Willard, C. J. This test was planned to further explore the reports of Staniforth (Proc. 6th An. Meeting NCWCC, p. 102-103), Meggitt and Willard (Res. Rept. 7th An. NCWCC, p. 100-101), and Hill and Willard (Res. Rept. 8th An. Meeting NCWCC, p. 67-68). Ohio W64 corn was drilled May 31 and June 2, 1952 in 42-inch rows on Brookston soil, 4 row plots, at the Northwestern Substation, O.A.E.S., Hoytville, Ohio. The test was divided into two parts. The May 31 planting was sprayed, triplicated, with the alkanol amine salt of 2,4-D at $1\frac{1}{2}$, 1, and 2 lb. (also 4 lb. for first two applications) and the isopropyl ester of 2,4-D at 1/4, 1/2, 1, 2, and 4 lb. acid equivalent/acre on June 3, June 7 (coleoptile visible), June 10 (2 leaves), June 13 (3-4 leaves), June 16 (5 leaves), June 19 (6-7 leaves), June 23 (7 leaves), June 25 (8 leaves), June 28 (9 leaves), July 1 (10-11 leaves) and July 5 (12-13 leaves). Checks with and without cultivations were included on each date. In the June 2 planting triplicated plots were sprayed at 24 hr. intervals with the alkanol amine salt at 2 lb./A., acid equivalent, and the isopropyl ester at the same rate beginning June 9 (1 leaf) and ending July 13 (15-16 leaves). Summer was unusually dry with only 1.08 inches of rain during the period June 1 to July 13. The greatest visible damage was noted when corn was sprayed in the 4-leaf to the 8-leaf stages. Severe onion leaf and stunting resulted but the former effect was outgrown by maturity. No inhibition of tassels at any stage with any rate. These results are similar to those reported by Meggitt and Willard in 1950. Considerable damage at the 2-leaf stage was reported by Hill and Willard in 1951. Although some damage was noted at this stage this year, it was usually not permanent. Some stunting resulted with the higher rates of the ester. However, in the more moist depressions in the field, severe spiking and stunting resulted as early as the 2-leaf stage with the 2 and 4 lb. rates of the ester. Here tassel emergence was greatly delayed. This suggests a moisture relationship to the severity of damage to corn by 2,4-D. The plots were not harvested on date of report, but it appears that yields will not be greatly reduced by 2,4-D in any plot. (Contribution of Ohio Agricultural Experiment Station.)

Pre-emergence, post-emergence, and pre-harvest applications of CMU on corn, flax, soybeans, and alfalfa. Robinson, R. G., Wiese, A. F., Anderson, L. E. and Dunham, R. S. The following observations are reported on the basis of only one year's trial. Further investigations are planned. Pre-emergence applications on corn at 2 and 4 lb. per acre gave good control of annual weeds all season but

injured corn. Soil applications of 2 lb. per acre at lay-by gave excellent weed control. Pre- and post-emergence applications on flax at 2 and 4 lb. per acre resulted in some selective removal of wild mustard, foxtails, and wild oats. Yields of flax from pre-emergence and early post-emergence applications were equal to weed-free checks. Pre-emergence applications on soybeans at 1 and 2 lb. per acre gave fair weed control. Post-emergence applications as low as 0.5 lb. killed soybeans. As a pre-harvest drying spray, 2 lb. in various carriers was less effective than dinitro-defoliants on soybeans, alfalfa, and corn. (Contribution from the Division of Agronomy and Plant Genetics, University of Minnesota; St. Paul, Minn. Paper No. 2926 Sci. Jour. Series, Minn. Agr. Exp. Station.)

Evaluation of chemicals for pre-emergence weed control in corn. Slife, F. W. The following chemicals were applied to corn at the indicated rates as a pre-emergence spray. 2,4-D ester at 1½ lb/A, Endothal 3003 at 4, 6, and 8 lb/A, SES at 4 and 6 lb/A, DNOSBP at 6, 8, and 10 lb/A, CMU at 1, 2, and 3 lb/A, methyl ester of trichlorobenzoic acid at 5 and 10 lb/A and 2,4-D in Johnsons Wax at 1½ lb/A. Chemicals were applied 3 days after planting. Soil type was a Flanagan silt loam and the seedbed was in excellent condition at time of treatment. Weed seeds germinated promptly on the check plots and conditions were excellent for pre-emergence sprays since a light rain fell 1 week after corn planting. All chemicals gave good weed control but the endothal and 2,4-D preparations seem to have less residual effect in this test and treated plots were becoming reinfested with weeds in approximately 5 weeks. Endothal was most effective at 8 lb/A. Under conditions where pre-emergence treatments are expected to last all season DNOSBP, CMU, and SES might be desirable over 2,4-D preparations. Corn was not injured at any of the 3 rates of DNOSBP and weed control was excellent all season. CMU gave excellent weed control at all 3 rates but some corn injury at the 3 lb. rate. This injury was reduction in vigor and size of corn plants and this will probably be reflected in yields. On heavy soils CMU at 2 lb/A has given outstanding pre-emergence results on corn for 2 years. SES gave comparable weed control with no corn injury at 4 and 6 lb/A. This compound seems to have more residual action than 2,4-D at the rates studied in this test. The methyl ester of trichlorobenzoic acid gave excellent weed control at 10 lb/A and very good control at 5 lb. with no corn injury. This material seems to have longer residual action than 2,4-D when used at 10 lb/A and should be investigated further. (Contribution of the Illinois Agricultural Experiment Station, Urbana, Illinois.)

Pre-emergence herbicides and cultivation for weed control in field corn. Staniforth, D. W. and Bakke, A. L. Four herbicides, 2,4-D amine, 2,4-D ester, SES and CMU were applied as residual pre-emergence sprays to field corn at rates of 1 and 2 pounds of active ingredient per acre Spray applications were made on separate plots at three dates; immediately after seeding, one day before corn emergence and corn at the 3-4 leaf stage. No weeds had emerged at the first two dates; seedling weeds at the 2-3 leaf stage were present at the third date. The corn was seed May 6 in drilled rows. Weeds were seeded prior to corn planting. The chief weed species present were foxtail, smartweed and pigweed. One inch of rain fell two days after the corn was planted. Plots consisted of two rows, 32 feet long with guard rows. Two untreated check plots were included in each rate comparison. Both checks were cultivated three times and one was kept entirely weed free by hand. The first cultivation, made June 3, was omitted on all sprayed plots. All plots were included in the second and third cultivations. The 2,4-D formulations at 1 and 2 pounds per acre for all dates gave good control of annual weeds when combined two cultivations. This control was 2-3 times better than in the cultivated checks. SES and CMU generally gave poor weed control and no crop injury. Yields of corn in the 2,4-D treated plots equaled or bettered that of

the cultivated checks, except with the ester at the third date which reduced yields severely. Hand weeded checks yielded an average of 8 bushels per acre more corn than checks which were cultivated only. (Contribution from Botany and Plant Pathology and Farm Crops Departments, Iowa Agricultural Experiment Station.)

The effect of pre-emergence herbicides on ensilage corn. Taylor, D. K. Treatments to replicated plots of ensilage corn included CMU at 1, 2, and 3 lb/A, immediately following seeding, and DNOSBP alkanolamine salt (Premerge) at $4\frac{1}{2}$ and $7\frac{1}{2}$ lb/A phenol equivalent, six days after seeding just prior to emergence. Immediately following the CMU applications 1.28" of rain was recorded while in the month following emergence a total of 4.76" was experienced. The control of annual weed growth was very good for the first 3-4 weeks but in the period following a few annual weeds became established in the CMU at 1 lb/A and the DNOSBP plots. Established perennial weeds such as horsetail (Equisetum arvense) and couch grass (Agropyron repens) were not controlled. The herbicide treatments did not differ significantly in yield among themselves but all gave significant yield increases over the check. The highest yielding treatment, CMU at 2 lb/A, gave 33.7 t/A of green matter and the lowest, CMU at 3 lb/A, 30.5 t/A, compared to 24.6 t/A for the unweeded check. (Contribution from the Dominion Experimental Farm, Agassiz, B. C.)

SORGHUMS

Summary

W. C. Elder

One abstract each from two states was submitted on sorghums. Both abstracts were concerned with the response of sorghum varieties to different herbicides applied at different rates.

Different formulations of 2,4-D, 2,4,5-T and MCP were used. One abstract reports little damage to brace roots on the sorghum plants, while the other lists this as the only injury that could be detected by observation. This characteristic injury has been reported in past years by most all studies on sorghums where 2,4-D was used.

Heavy treatments caused a slight delay of maturity in one of the tests, and affected the exertion of the heads in some varieties.

Rates at 1 lb/A level was necessary to cause any reduction in yield of grain. 1/4 lb. or 1/2 lb/A did not affect grain yields, but brace root injury was very noticeable in one of the tests at these lower rates.

As in past years, some of the varieties were more susceptible to 2,4-D than others. Resistant Wheatland and Westland appear to be more susceptible to 2,4-D than other varieties in these tests. Several varieties were not affected when 1 lb/A of 2,4-D ester was used.

2,4-D amine was not as severe on the sorghums as 2,4-D ester when used at rate of 1 lb/A. One test reports that 2,4,5-T ester was less injurious to sorghums than 2,4-D ester. MCP was reported as being very similar to 2,4,5-T in its reaction on sorghums.

Tolerance of combine sorghums to 2,4-D, 2,4,5-T, and MCP. Elder, W. C., Davies, Frank F., and Dreessen, Jack. Rates and chemicals used: 0, 1/2 lb/A 2,4-D amine and 1 lb/A each isopropyl ester of 2,4-D and 2,4,5-T and MCP. Combine sorghum varieties used in test: Resistant Wheatland, Martin, Midland, Redlan, Dwarf Kafir 44-14 and Darset. To secure accurate yields, the plants were hand thinned to 4 plants per hill spaced 28 in. apart in 3 1/2 ft. rows. It was extremely hot and dry at time the applications were made, however, the sorghums were growing rapidly. The sorghums were 18 in. high at time of spraying. All chemicals used caused typical brace root injury to the plants. Perhaps because of the hot dry weather at time of treatment, it was impossible to observe different degrees of injury from the different rates and chemicals used. In similar tests in past years, it was easy to detect by observation more injury to individual varieties or from different amounts and types of chemicals used. As in past years, Resistant Wheatland grain production was lowered by the 1 lb/A of all chemicals. The grain yield was not affected in the other five varieties by any of the treatments. The yields in 1952 were above average, as compared with the last 5 years. Grain yields were not affected in Resistant Wheatland with 1/2 lb/A of amine 2,4-D. 1 lb/A amine 2,4-D lowered yields 7%-10% and the 1 lb/A of ester 2,4-D, ester 2,4,5-T and MCP reduced production 15%-20%. (Contribution of the Agronomy Department, Oklahoma Experiment Station, Stillwater, Oklahoma.)

Response of 10 sorghum varieties to 2,4-D, 2,4,5-T and MCP treatments. Gassaway, James E., Porter, Kenneth B., and Whitfield, Charles J. Varieties Redbine-60, Westland, Martin, Double Dwarf Yellow Sooner, Early Hegari, Combine 7078, Double Dwarf Shallu, Combine Kafir-60, Double Dwarf Texas milo and Sweet Sudan were treated with the acid equivalent of 0, 1/4, 1/2, and 1 lb/A of the isopropyl esters of 2,4-D; 1/2 and 1 lb/A of the isopropyl esters of 2,4,5-T and 1/2 and 1 lb. of the butoxy ethanol esters of MCP. Applications were made with a conventional overhead sprayer when the plants were 10 to 12 inches tall and growing rapidly. All varieties, excepting two early maturing ones, Double Dwarf Yellow Sooner and Double Dwarf Texas milo, were under stress for moisture during and after flowering stage. Negligible brace root fasciation was observed in all varieties of treatments. One to three days delay in head emergence and flowering resulted from heavier treatments in all varieties. 1 lb. treatments reduced exertion of the heads in all varieties, particularly Westland and Double Dwarf Texas milo. This interfered with harvest of the heads. 1/4 and 1/2 lb. of 2,4-D treated plots had yields in all varieties comparable to or greater than those of the check plots. When compared to the check 1 lb. of 2,4-D reduced yields of Redbine-60, 1.91 bu/A; Westland, 5.41 bu/A; Combine Kafir-60, 2.71 bu/A; Double Dwarf Texas milo, 3.81 bu/A. The effect on other varieties was less significant. 1 lb. of 2,4,5-T reduced yields in Redbine-60, 2.60 bu/A; Westland, 3.65 bu/A. Reductions from 2,4,5-T were generally less than that produced by 1 lb. of 2,4-D. 1/2 lb. MCP reduced yields of Redbine-60 1.32 bu/A, and Westland, 1.62 bu/A. When treated with 1 lb. MCP Redbine-60 yielded 2.46 bu/A less than the check; Westland yielded 2.83 bu/A less, and Combine Kafir-60 yielded 1.65 bu/A less. Test weights on grain showed no particular difference between varieties as influenced by treatments. (Contribution of the Amarillo Conservation Experiment Station, Amarillo, Texas.)

SOYBEANS AND PEAS

Summary

F. W. Slife

Chemical weed control has not progressed so rapidly in soybeans and peas as in some other crops. The chief reason seems to be that these crops are susceptible to most of the chemicals that have been used. In general, pre-emergence treatments have been successful if no rain has fallen between treatment and emergence of the crop. If rain has fallen before emergence, then crop injury has often resulted. It seems probable that the results from use of pre-emergence sprays will continue to vary until some chemical is found that is affected less by weather conditions than the ones that have been tried so far.

All of the eight abstracts reporting results of tests with soybeans deal with chemicals applied as pre-emergence treatments. Several compare the results obtained with 3 Cl-IPC and DNOSBP. These data indicate that, although 3 Cl-IPC may be safer in so far as soybean injury is concerned, the DNSOBP is slightly more effective for general weed control.

A large number of other chemicals were tested as pre-emergence herbicides. They include CMU, sodium PCP, Endothal, micronized 2,4-D and 2,4,5-T acid, SES, N-1 naphthyl phthalamic acid, 2,4-D ester, and MCP. Reports of the results obtained so far indicate that a number of these materials deserve further testing.

The seven abstracts received on canning peas deal with both pre- and post-emergence treatments. A large number of chemicals were tested as pre-emergence sprays. Although the results varied considerably because of weather conditions, in general they were encouraging. Several abstracts dealing with MCP applied as a post-emergence spray indicate that this chemical may become standard for use as a post-emergence spray along with DNSOBP.

Abstracts of Results of Cooperators

Pre-emergence herbicides on soybeans. Burt, Evert O., Ilnicki, Richard D. and Willard, C. J. Two experiments - Columbus, Ohio (Burt), planted May 27, and Hoytville, Ohio (Ilnicki), planted June 5. Soybeans (Lincoln at Columbus, Hawkeye at Hoytville) were drilled solid in 25-foot plots, and a mixture of rape (1 part) and German millet (2 parts) was sown broadcast from the grass-seed attachment to simulate weeds. The soil at Columbus was Miami (low organic matter), partly Brookston (high organic matter), silty clay loams; at Hoytville, Brookston clay (high organic matter). All herbicides were applied in 40 gpa of water.

At Hoytville, no herbicides damaged the beans--the weather was very dry and there was no rain to carry herbicides down. The herbicides used and results obtained were: N-1 naphthyl phthalamic acid at 2 1/2, 5, and 7 1/2 pounds per acre gave the best weed control, 7 1/2 pounds per acre giving 60 percent control. DNOSBP (Premerge) at 5, 7 1/2, 10, and 15 pounds per acre gave 46 percent and 65 percent control, respectively, at 10 and 15 pounds per acre. 3-(p-chlorophenyl)-1,1-dimethylurea (CMU) at 1, 2, and 4 pounds per acre gave 52 percent weed control at 4 pounds per acre. The lower rates were less effective. The alkanolamine and isopropyl ester of 2,4-D were ineffective at 1 pound per acre. At the rate of 2 pounds per acre, the ester and amine gave 40 percent and 36 percent control, respectively. Sodium 3, 6-endoxyhexahydrophthalate (Endothal 3003) gave 42 percent control at the rate of 6 pounds per acre; 2 and 4 pound per acre rates were not effective. 3-chloro-IPC was ineffective at 2, 4, 6, 8 and 10 pounds per

acre, the 10 pound per acre rate, giving only 36 percent control of all weeds. Yields will not be taken, but observations indicate that there will be no significant differences in yields of any of the plots.

At Columbus, the season was also dry, but with more rain than at Hoytville. DNOSBP, alkanolamine salt (Premerge) at 5, 7 1/2, 10, and 15 pounds per acre gave 63, 83, 93 and 100 percent control of broadleaves and 30, 23, 57, and 87 percent percent control of grasses,respectively. The 15 pound rate reduced stand of soybeans 37 percent; other rates did not damage beans. Sodium 3,6-endoxyhexahydrophthalate (Endothal 3003) at 2, 4, and 6 pounds per acre was ineffective. N-1 naphthyl phthalamic acid at 2 1/2, 5, and 7 1/2 pounds per acre gave excellent control of broadleaves and very good control of grasses, with no damage to soybeans at all rates. 3-chloro-IPC at 2, 4, 6, 8, and 10 pounds per acre gave 5, 27, 48, 51, and 55 percent control of weeds, respectively, with no damage to soybeans. CMU (parachlorophenyl-1,1-dimethylurea) at 1, 2, and 4 pounds per acre gave 10, 43, and 85 percent weed control, and 13, 30, and 80 percent reduction in stand of soybeans, respectively. The amine salt and isopropyl ester of 2,4-D at 1 and 2 pounds per acre were mediocre. 2,4-D wettable acid and 2,4,5-T wettable acid at 1 and 2 pounds per acre gave excellent control of broadleaves and poor control of grasses, with some damage to soybeans. MCP at 1 1/2 pounds per acre gave excellent control of broadleaves and good control of grasses, with 50 percent reduction in stand of soybeans. (Ohio Agricultural Experiment Station, Columbus, Ohio)

Effect of chemical pre-emergence sprays upon the yields of soybeans and fieldbeans, 1950-1952. Churchill, B. R. and Grigsby, B. H. In 1950 and 1951 replicated plots of soybeans and fieldbeans were given cultural and spray treatments. All plots received two cultivations. Yields are shown in Table 1.

Table 1.

Treatment	1950		1951	
	Soybeans	Fieldbeans	Soybeans	Fieldbeans
Check (2 cultivations only)	11.6	15.0	10.6	17.8
Check plus one hoeing	18.8	23.8	25.3	33.8
Check plus Premerge, 6 lb./acre	15.7	23.0	29.6	36.0
Check plus 2,4-D, 2 lb./acre	16.0	23.4	9.6	28.9
Check plus PCP, 16 lb./acre	--	--	27.5	35.6
Check plus E.H. No. 1 per acre	--	--	25.5	27.3

In 1951 bean and weed counts were made at harvest time on plots harvested, with the results shown in Table 2.

Table 2.

Treatment	Soybeans		Fieldbeans	
	Weeds per square yard	Beans per plot	Weeds per square yard	Beans per plot
Check (2 cultivations only)	21	89	21	93
Check plus one hoeing	1	101	3	86
Check plus Premerge, 6 lb./acre	2	92	5	86
Check plus 2,4-D, 2 lb./acre	2	18	1	31
Check plus PCP, 16 lb./acre	1	98	3	92
Check plus E.H. No. 1 per acre	1	75	3	54

In 1952 Premerge was sprayed on soybeans and fieldbeans at rates of 3 and 6 pounds per acre and PCP at rates of 8 and 16 pounds per acre. Treatments included two applications (at seeding and at emergence) and two types of coverage (full and band). Band spraying included a 10-inch strip over the row only. Yields from 1952 treatments have not been calculated. (Michigan Agricultural Experiment Station, East Lansing, Michigan)

Pre-emergence weed control in Hawkeye soybeans. Finerty, D. W., Hanway, D. G., and Andersen, R. N. Beans were planted in Waukesau clay loam soil May 29. Treatments were applied May 31 in forty gallons of water per acre. Materials and rates per acre were: 4, 6, and 8 pounds Premerge (DNOSBP, amine salt); 8, 12, and 18 pounds sodium PCP; 1 and 2 pounds CMU; 4 pounds Endothal; 4, 8, and 16 pounds chloro-IPC; and 1 and 2 pounds 2,4-D micronized acid. Handweeded and non-weeded check plots were included. No precipitation occurred for 17 days following application of herbicides. Principal weeds present were crabgrass, yellow foxtail, and green foxtail.

Weed control notes were taken 37 days after spraying. Eight and 16 pounds chloro-IPC gave 58 percent and 77 percent weed control, respectively. Eight pounds Premerge resulted in 75 percent control, 2 pounds 2,4-D acid 72 percent control, and 2 pounds CMU 58 percent control. All other treatments gave less than 50 percent control of weeds. None of the treatments significantly affected yields of soybeans. (Nebraska Agricultural Experiment Station, Lincoln, Nebraska)

Comparison of CIPC and DNOSBP for control of weeds in soybeans. Hansen, J. R. and Freeman, J. F. CIPC and the alkanolamine salt of DNOSBP at rates of 2, 4, 6, 8, and 10 pounds per acre were applied to Wabash soybeans prior to planting, one day after planting, and seven days after planting when 50-75 percent of the beans had emerged.

Soybeans were planted in rows in a silty clay loam soil on May 14, 1951. One-half of each plot was rolled after planting. The unrolled portion was quite rough. About 1.5 inches of rain fell during the week following planting, before the seven-day application. Rainfall was very light thereafter. Principal weeds were red-root pigweed, crabgrass, Pennsylvania smartweed, and giant foxtail. Rolling the soil had little or no effect on weed control or crop tolerance in this situation.

Pre-planting treatments appeared definitely inferior to applications made at other times. CIPC gave better control of both broadleaved weeds and grass than DNOSBP at equal rates with applications made one day after planting and gave better control of grasses at other dates. Soybeans were quite tolerant of all rates of DNOSBP, although 10 pounds per acre reduced stands when applied at emergence. CIPC caused no reduction in stands at emergence, but caused serious injury at 8 and 10 pounds per acre on some plots sprayed on the first two dates. CIPC gave control of giant foxtail at 4 and 6 pounds per acre and smartweeds at 2 pounds per acre. Weeds were controlled between rows by better treatments until about July 1. (Kentucky Agricultural Experiment Station, Lexington, Kentucky)

Weed control in peas. Hemphill, D. D. DNOSBP, amine salt (Premerge), 4 pounds per acre; N-1 naphthyl phthalamic, 5 pounds per acre; CMU, 1 pounds per acre; MCP (amine salt), 1/2 pound per acre; and SES, 4 pounds per acre each were applied to four replicated randomized plots of peas, Wando variety, four days after planting. Approximately one month later these plots were treated as follows: Premerge plots, sprayed with DNOSBP, ammonium salt (Dow Selective) 1 1/2 pounds per acre; N-1 naphthyl phthalamic plots and SES plots, retreated with pre-emergence rates; MCP plots, sprayed with 1/4 pound per acre; and CMU plots, not retreated.

The most satisfactory weed control was obtained with CMU, while DNOSBP ranked second. N-1 naphthyl phthalamic controlled less than 25 percent of the weeds. Highest yields came from CMU plots. SES and MCP caused visible injury, and this was evident in reduced yields. (Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri)

2,4-dichlorophenoxyethyl benzoate (Sesin) on soybeans. Ilnicki, Richard D. and Willard, C. J. Sesin was received too late to be used in our earlier trials. Hawkeye soybeans were drilled solid August 1, 1952, in 8 x 25 foot plots and treated August 4, 1952. A mixture of rape and German millet was broadcast from the grass seed attachment of the drill to simulate weeds. Sesin was applied to replicated plots, in 40 gallon solution per acre, at 1 1/2, 3, and 4 1/2 pounds per acre of the active ingredient. 1.08 inches of rain fell between the time of treatment and the emergence of the beans.

The 4 1/2 pound rate reduced the soybean stand 78 percent, with 100 percent control of all weeds; the 3 pound rate reduced the soybean stand 65 percent with 95 percent control of grasses and 96 percent control of broadleaves; the 1 1/2 pound rate reduced soybean stand 57 percent with 90 percent and 96 percent control of grass and broadleaf weeds, respectively. (Ohio Agricultural Experiment Station, Columbus, Ohio)

Comparative effectiveness of MCP, DNOC, KCNO, and monosodium cyanamid for weed control in peas. L'Arrivee, J. C. M. and Andersen, E. T. MCP, sodium salt, at 1, 2 and 3 pounds per acre in 50 gallons of water was applied pre-emergently. The post-emergent treatments consisted of DNOC, sodium salt, at 1 1/2, 2 1/2 and 3 1/2 quarts per acre in 80 gallons of water; KCNO at 8, 16 and 24 pounds per acre, and monosodium cyanamid at 16, 32 and 48 pounds per acre in 50 gallons of water. The pre-emergent treatment was applied during a dry period, whereas excessive moisture made post-emergent applications difficult. Two varieties of canning peas, Pacemaker and Early Perfection, were used in a double split plot design. The predominant weeds were pigweed (Amaranthus retroflexus), lamb's quarters (Chenopodium album), maple-leaved goosefoot (Chenopodium hybridum), stinkweed (Thlaspi arvense) and barnyard grass (Echinochloa crusgalli).

The peas and weeds were harvested at the same time. Results indicated that only the two higher rates of MCP and the highest rate of monosodium cyanimid caused a significant reduction in pea yields. The only treatments which did not effectively control the weeds were DNOC at 1 1/2 quarts per acre and monosodium cyanamid at 16 pounds per acre. The average weight of weeds per plot for the treatments were: MCP 0.96 pound, KCNO 4.35 pounds, monosodium cyanimid 6.18 pounds, and DNOC, sodium salt 9.06 pounds. The average weight of weeds for the check plots was 13.31 pounds. (Division of Plant Science, University of Manitoba, Winnipeg)

Post-emergent application of chemicals for weed control in peas. L'Arrivee, J. C. M. and Andersen, E. T. Plots of 30 square feet of Resistance Surprise were treated with various herbicides when the peas were about 6 to 8 inches high. The predominant weeds at the time of application were pigweed (Amaranthus retroflexus), lamb's quarters (Chenopodium album), maple-leaved goosefoot (Chenopodium hybridum), barnyard grass (Echinochloa crusgalli), and green foxtail (Setaria viridis), MCP butyl, amine, and sodium salt each at 1/3, 2/3 and 1 pound per acre gave excellent control of weeds but caused severe distortion of the pea plants.

Recovery was complete with the lowest rates of MCP amine and sodium salt, but maturity of the crop was retarded by the higher rates. MCP, butyl ester, at the rates used was considered impractical. MH at 3, 6 and 9 pounds per acre gave good

control of weeds without affecting the peas. IPC at 2, 4 and 6 pounds per acre and CIPC at 1, 2 and 3 pounds per acre were both ineffective in controlling weeds. CIPC caused flecking of the pea foliage. Because of heavy rains toward the end of June and severe crop injury, yields were not taken. (Division of Plant Science, University of Manitoba, Winnipeg)

Pre-emergent application of chemicals for weed control in peas. L'Arrivee, J. C. M. and Andersen, E. T. Plots of 30 square feet of Resistance Surprise peas were treated one to two days before emergence with various herbicides. Because of the early spring drought, there were no weeds present, and the effect of the chemicals in reducing the number of weeds which later appeared may be attributed to residual action. The predominant weeds in the check plots were pigweed (Amaranthus retroflexus), lamb's quarters (Chenopodium album), maple-leaved goosefoot (Chenopodium hybridum), barnyard grass (Echinochloa crusgalli), and green foxtail (Setaria viridis)

N-1 naphthyl phthalamic acid (1-608) and MH both at 3, 6 and 9 pounds per acre and SES at 2, 4 and 6 pounds per acre gave good control of weeds. Endothal (EC3740) at 2, 4 and 6 pounds per acre was ineffective at the lower rate but gave excellent control of the green foxtail at the 4 and 6 pound rates. CIPC at 3, 6 and 9 pounds per acre; DNOSBP at 3, 6 and 9 quarts per acre; IPC st 5, 10 and 15 pounds per acre; CMU at 1/2, 1 and 1 1/2 pounds per acre; and xanthogen disulphide at 10, 20 and 30 pounds per acre were ineffective in reducing the weeds. The only chemical that injured the peas was xanthogen disulphide at 30 pounds per acre. (Division of Plant Science, University of Manitoba, Winnipeg)

Comparative effects of three formulations of MCP for weed control in peas. L'Arrivee, J. C. M. and Andersen, E. T. The effectiveness of the three available forms of MCP (butyl ester, amine and sodium salt) were compared both pre- and post-emergently on peas. The predominant weeds were pigweed (Amaranthus retroflexus), purslane (Portulaca oleracea), green foxtail (Setaria viridis), and lamb's quarters (Chenopodium album). The pre-emergent treatments consisted of 1, 2 and 3 pound per acre applications in 40 gallons of water.

Excellent control of the broad-leaved weeds resulted from all the rates. There was a proportional reduction in pea stand as the rates increased. The post-emergent treatments consisted of applications of 1/3, 2/3, and 1 pound per acre in 40 gallons of water when the peas were about 6 inches high. The lowest rate of the amine and sodium salt caused slight distortions of the peas, from which they recovered fully. The broad-leaved weeds were effectively controlled. The 2/3 pound per acre rate of amine and sodium salt, and the 1/3 pound per acre rate of butyl ester caused considerable distortion of the pea vines and retarded the maturity of the crop. Excellent control of the broad-leaved weeds and about 60 percent control of the grass weeds resulted. The 1 pound per acre rate of the amine and sodium salt, and the 2/3 pound per acre rate of the butyl ester caused very severe distortion of the crop and also retarded its maturity. The highest rate of the butyl ester almost killed the peas. Field tests carried out simultaneously confirmed the results from the experimental plots. (Division of Plant Science, University of Manitoba, Winnipeg)

Pre-emergence use of DNOSBP and CIPC in soybeans. Lee, Oliver C. DNOSBP at rates of 6, 8 and 10 pounds per acre and CIPC at rates of 4, 6 and 10 pounds per acre, in single plot treatments, were applied to soybeans (Hawkeye) in three locations. Materials were applied some 24 to 48 hours before emergence of the soybeans. The soil in two locations is "Drummer" and in the other "Miami." Moisture was abundant during May and June, followed by a dry summer.

All rates of DNOSBP caused temporary dwarfing of soybean plants. Rates of 8 and 10 pounds reduced the stand 30 percent and 50 percent respectively. Rates of 8 and 10 pounds gave satisfactory weed control, while the 6-pound rate gave only partial control. CIPC at the rates applied did not reduce the stand of soybeans. The 10-pound rate caused slight stunting of plants. Grasses and smartweed only were controlled by the 10-pound rate. No significant effect of treatments on yields was found. (Department of Botany and Plant Pathology, Purdue University, Lafayette, Indiana)

Effect of amine MCP on field peas, 1952. Pavlychenko, T. K. Prior to 1952, the amine salt of MCP (Weedar MCP) was tested on field peas for several seasons. Most of the preliminary tests showed that the material was reasonably effective on common weeds and also safe for the crop. On the basis of this information, a large-scale application of MCP amine (Weedar MCP) was made on field peas at Prince Albert and at Weldon, Saskatchewan in 1952, on Mr. J. Caplan's farms. At the two places 2,500 acres of field peas were treated at rates of 3 1/2 ounces per acre when the crop was mostly from 4 to 7 inches high. The fields were heavily infested with stinkweed (Thlaspe arvense), red-root pigweed (Amaranthus retroflexus), wild buckwheat (Polygonum convolvulus) and in large patches with perennial sow thistle (Sonchus arvensis) and Canada thistle (Circium arvense).

Results: For several days a typical bending of the crop due to treatment with MCP was observed in all fields. The younger peas, however, recovered much faster. At maturity the crop produced yields of 20 to 25 bushels per acre (estimated) with a perfect quality of seed. Stinkweed was effectively controlled and produced no seed except where it was too advanced during the treatment. The young red-root pigweed plants were stunted or killed. Wild buckwheat never developed to interfere with harvesting operations and exerted only slight competition to the crop in spite of great prevalence. The top roots of both red-root pigweed and wild buckwheat were sick looking, swollen, and covered with clusters of short fibrous roots. Canada thistle was very greatly reduced in stand or badly twisted. The top growth of perennial sow thistle was mostly killed, but new rosettes were numerous before the crop was harvested. (Research Department, American Chemical Paint Company, Ambler, Pennsylvania)

A comparison of 3 Cl-IPC and DNSOBP as pre-emergence herbicides for soybeans. Slife, F. W. These two chemicals were compared at three rates each in seven locations in the soybean-growing area in Illinois. Although each area was located on a different type of soil, all soils were heavy clay loams. Rates used of each chemical were 3 Cl-IPC at 4, 6, and 8 pounds per acre and DNSOBP at 6, 8, and 10 pounds per acre. Because the date of applying the chemical after planting varied with each location, no conclusions can be drawn as to date of treatment. Two locations were abnormally dry at time of treatment and remained so for six weeks afterwards. Neither chemical gave good results under these conditions. In the other five locations, where the soil was moist at time of treatment and the rainfall after treatment was normal, these chemicals gave good pre-emergence results.

DNSOBP at 6 pounds per acre gave good to excellent control of weeds, with no soybean injury. At 8 pounds per acre, control was excellent, with slight damage to the soybeans. This damage was some stem burning and up to 10 percent reduction in stand. Later observations indicate that the 8-pound rate would cause no yield reduction. At 10 pounds per acre, weed control was excellent, with moderate to severe damage to soybeans. This damage was up to 25 percent reduction in stand and some severe stem burning. Later observations indicate that yield on the DNSOBP plots would be about the same with the 10-pound rate of application as with lower rates. 3 Cl-IPC was not effective in controlling weeds at 4 pounds per acre. There

was no soybean injury at this rate. At 6 pounds per acre, weed control was good, with no soybean injury. At 8 pounds per acre, weed control was good to excellent but did not average out so well as 6 pounds of DNSOBP. There was no soybean injury at this rate.

DNSOBP seems to control broadleaved weeds better than grass weeds, while 3 Cl-IPC seems to control grass weeds slightly better than broadleaved weeds. 3 Cl-IPC did not control giant ragweed (Ambrosia trifida) well at any rate used in this test. (Illinois Agricultural Experiment Station, Urbana, Illinois)

Pre-emergence herbicides and shallow cultivation for weed control in soybeans. Staniforth, D. W. and Weber, C. R. Hawkeye soybeans were seeded 1 1/2 inches deep on May 19, using two methods of planting: 42-inch drilled rows and 7-inch spaced solid seeding. A pre-emergence treatment of 1 1/2 pounds 2,4-D ester per acre was applied immediately after seeding. Three days after application of the 2,4-D, 1 1/2 inches of rainfall was recorded. The plots were split so that one set of plots received two shallow cultivations with a finger weeder 10 days and 15 days after bean emergence. Weather conditions were optimum for this type of control measure. The 42-inch spaced rows also received three shovel cultivations during the season.

The pre-emergence treatment caused some reduction in stand of soybeans but also gave good early control of annual grass and broadleaved weeds. In the solid-seeded beans which received no shallow cultivation, the weed infestation at harvest was equally heavy in both the check and treated plots. Solid-seeded beans which received two shallow cultivations had much less weed infestation than those which received no cultivation. Beans in 42-inch rows were relatively clean at harvest, with little difference evident between plots which received shallow cultivation and none. However, the shallow cultivation was equally as effective as the early shovel cultivation in weed control. Yields of beans were not reduced significantly by the 2,4-D treatment. Solid-seeded beans yielded slightly more than 42-inch row seedings. Shallow cultivation resulted in significantly increased yields in the solid plantings but not in the rows. The 2,4-D pre-emergence treatment did not appreciably reduce weed infestations in solid-seeded beans either with or without shallow cultivation. (Departments of Botany and Plant Pathology and Farm Crops, Iowa Agricultural Experiment Station, Ames, Iowa)

Effect of pre-emergence herbicides on Alaska peas. Taylor, D. K. Treatments to replicated plots of Alaska peas included CMU at 1/4, 1/2, 1, and 1 1/2 pounds per acre immediately following seeding, and DNOSBP alkanolamine salt (Premerge) at 4 1/2 and 7 1/2 pounds per acre, phenol equivalent six days after seeding, just prior to emergence. Immediately following the CMU applications 1.28 inches of rain were recorded, while in the month following emergence a total of 4.76 inches was experienced.

The control of annual weed growth was very good for the first three to four weeks, while in the period following a few annual weeds became established in plots treated with DNOSBP and the lighter rates of CMU. Established perennial weeds, such as horsetail (Equisetum arvense) and couch grass (Agropyron repens), were not controlled. Although all treatments yielded more than the check plots, the yield differences were not statistically significant. Crop injury was not evident from any of the treatments applied. (Dominion Experimental Farm, Agassiz, B. C.)

LEGUMINOUS FORAGES

Summary

John H. Miller

Fifteen abstracts from eleven sources were received. Ten abstracts were related to seedling legumes and five were concerned with established stands. As in the past, alfalfa was studied more widely than any other legume. Fourteen abstracts dealt with alfalfa, five with sweet clover, four each with ladino and red clover, and three with alsike clover. The herbicides used included several formulations of 2,4-D and MCP, 2,4,5-T, a mixture of 2,4-D and 2,4,5-T, 4-chlorophenoxyacetic acid, TCA, IPC, CIPC, PCP, Endothal, CMU, KCNO, and DNOSBP.

Most workers reported seedling stands of legumes to be injured very little by applications of 2,4-D and MCP as salts at the 1/4 lb. rate. One worker however, found this rate to significantly reduce alfalfa stands sprayed when the alfalfa was 5-6 inches tall. The ester formulations of these herbicides generally produced injury to legumes at this rate. Sweet clover, as in the past, was generally somewhat more sensitive than other legumes to 2,4-D and MCP. While most workers did not indicate an important difference between 2,4-D and MCP as herbicides on legumes, two workers reported somewhat less injury from MCP. One worker found TCA at 15 and 20 lb. seriously injured seedling alfalfa and sweet clover stands, however, in general, rates of 10 lb. and less caused little injury to these crops. One worker reported some injury to ladino by TCA at the 10 lb. rate. Alsike and red clover were seriously injured by TCA. DNOSBP was used in five trials. In three of these, no injury to legumes was reported. The amine salt of DNOSBP used pre-emergence caused injury to alfalfa.

The abstracts concerned with herbicide application to established legumes indicate considerable more damage to legumes than was reported in previous years. In almost all cases, application of 2,4-D and MCP at 1/4 lb. and above seriously reduced yield and in many cases, also reduced stands. This was particularly true for alfalfa. One report indicated little injury to alfalfa when the application was made to alfalfa that had barely started growth in the spring. Two reports indicate little injury to established alfalfa by TCA at rates of 5 to 10 lb. Red and alsike clover were seriously damaged by TCA.

Four reports on CIPC were received, but the results were very erratic. Single reports related to 2,4,5-T, 4-chlorophenoxyacetic acid, mixtures of 2,4-D and 2,4,5-T, IPC, PCP, KCNO, Endothal, and CMU were received. Of these, favorable results were indicated for 2,4,5-T and 4-chlorophenoxyacetic acid at 1/4 lb. on alfalfa; and CMU at 1 lb., PCP at 8 lb., IPC at 4 lb., on seedling sweet clover, alfalfa, ladino, alsike and red clover. Endothal at 4 lb. did little damage to red clover, but injured all other legumes particularly ladino. KCNO, at rates up to 20 lb. and a mixture of 2,4-D and 2,4,5-T at 3 lb. applied pre-emergence did not seriously injure alfalfa or sweet clover emergence but they did not provide control of Russian pigweed.

Abstracts of Results of Cooperators.

Effect of 2,4-D and MCP on control of annual weeds in alfalfa seed fields, 1952. Bolton, J. L. and R. T. Coupland. Duplicated field-scale applications of 2,4-D amine (a mixture - Naugatuck) and ester (butyl) and MCP amine and ester (butyl) were made in an old stand of alfalfa near Nipawin on April 23. The rates used were 0, 4, 8 and 16 oz/A. Alfalfa had barely started to grow following burning a few days previously. No effect on alfalfa was noted and there was no apparent difference in seed yield between check plots and treatments. The principal weeds present were lambsquarters (Chenopodium album L.) and Russian pigweed (Axyris amaranthoides L.). Only sparse stands of these species developed in the control plots. MCP apparently controlled these weeds better than 2,4-D and the ester formulation was more effective than the amine. Control was definitely better at the 16 oz. rate of each herbicide. These results indicate the possibility of controlling these weed species in alfalfa by means of MCP and 2,4-D when application is made before growth of alfalfa begins. Previous work has indicated that these herbicides seriously affect seed yield of alfalfa when applied at a more advanced stage. (Contribution from the Dominion Forage Crops Laboratory and the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

Chemical control of weeds in alfalfa. Brown, D.A. Treatments and rates per acre - (1) 2,4-D butyl ester 3 oz. acid, (2) 2,4-D amine 5 oz. salt, (3) MCP amine 5 oz. salt, (4) MCP sodium 6 oz. salt, (5) DNOSBP 4 qts. applications were made in a water spray under high pressure at 120 Imperial gal. per acre. When treated, alfalfa seedlings were 1-3 inches tall and weeds in late seedling stage. Barley, as a companion crop was six inches in height. A heavy infestation of stinkweed, lambsquarters, red root pigweed, Russian pigweed, Russian thistle and common buckwheat covered the plots.

Results: Butyl ester 2,4-D satisfactorily killed stinkweed, lambsquarters and Russian pigweed, killed red root 60% but left most of the Russian thistle and buckwheat. It left alfalfa seedlings severely twisted and at the end of the season the stand of alfalfa was less than 50%. Amine salt of 2,4-D killed stinkweed, lambsquarters and Russian pigweed satisfactorily but gave poor control of red root, Russian thistle, buckwheat and perennial sowthistle. There was some twisting of alfalfa stems but recovery was good and the stand was normal at the end of the season. MCP amine gave results very comparable to the 2,4-D amine and the MCP sodium salt killed all susceptible weeds satisfactorily without inflicting visual damage to alfalfa. DNOSBP killed all weeds effectively except Russian thistle and perennial sowthistle. This treatment scorched the barley slightly but caused no apparent damage to alfalfa. (Contributed by Experimental Farm, Brandon, Manitoba, Canada.)

Responses of established alfalfa to four phenoxy herbicides. Buchholtz, K. P. Plots 6 by 12 ft. in size in a second year stand of Ranger alfalfa were treated with the amine salt preparations of 2,4-D, MCP, 2,4,5-T and 4-chlorophenoxyacetic acid (4-chloro) at rates of 0.25, 0.50 and 1.0 lbs. acid equivalent per acre. Applications were made on April 23, 1952 when the alfalfa was about 4 in. high using water equal to 20 gal/A. The yields of hay on each plot were determined on June 27. Plant counts were obtained on July 23.

Material	Hay yield - lbs/A			Plants/sq.ft.		
	0.25	0.50	1.0	0.25	0.50	1.0
2,4-D	2402**	1824**	911**	11.3**	9.2**	2.8**
MCP	2744**	1292**	1244**	13.4*	4.4**	1.2**
2,4,5-T	3563**	3040**	2562**	15.2	14.4	13.5*
4-chloro	3948	3654*	2853**	15.9	15.0	14.5
Check	4404			15.3		

2,4,5-T and 4-chloro were much less toxic to the alfalfa than 2,4-D and MCP although they stunted the growth and tended to reduce yields. 2,4,5-T caused only slight leaf formative effects while 4-chloro caused severe effects. Second growth of alfalfa on plots treated with 2,4,5 T and 4-chloro appeared normal while plots treated with 2,4-D and MCP, with the exception of the 0.25 rate, were noticeably thinned. (Dept. of Agronomy, Univ. of Wis., Madison, Wisconsin.)

Herbicides on spring and summer seedings of alfalfa alone and in oats and wheat. Burt, Evert O. and C. J. Willard. Buffalo alfalfa was drilled April 29, 1952 on Miami-Brookston soil. Whole plots were 6 x 50 feet, one-half of each of which was sown to Clinton 59 oats. Plots were treated on one of three dates: May 1 (pre-emergence to alfalfa), May 9 (two-leaf stage), or May 19 (four-leaf stage). All treatments were applied in 40 gal. of water, per acre, replicated twice. Chloro-IPC was used at 1, 2, 3, 4, and 6 lb/A pre-emergence only. It was very effective against grasses at the 3 and 4 lb. rates, somewhat effective against broadleaved weeds, with severe damage to alfalfa. CIPC was very different on the two soil types - 3 lb/A killed oats and alfalfa on Miami (light-colored, tight, low-organic matter) soil and did little damage to either on the Brookston (black, high organic matter) soil 30 feet away. DNOSBP, alkanolamine salt (Premerge) at 1, 2, and 3 lb/A gave good weed control at the two high rates on the last two dates, with considerable damage to alfalfa; ineffective pre-emergence. Sodium TCA used at 4, 6, 8, and 10 lb/A gave excellent control of grasses, poor control of broadleaved weeds, with little damage to alfalfa at the 6 and 8 lb. rates. Calcium TCA at 6 and 8 lb/A gave results similar to those of equal amounts of sodium TCA. All herbicides were less toxic to all vegetation, especially alfalfa, when applied pre-emergence. Toxicity was most pronounced when alfalfa was treated at the four-leaf stage, with the two-leaf stage intermediate. Damage to oats was less than the damage to alfalfa even with TCA.

Arizona common alfalfa was drilled July 22, 1952 on a Miami-Brookston soil. Whole plots were 6 x 50 feet, one-half of each of which was sown to newly-harvested Thorne wheat, replicated three times. Plots were treated on July 25 (pre-emergence to alfalfa); August 12 (two-leaf stage), or August 18 (four- to six-leaf stage). Chloro-IPC was used at 1, 2, 3, 4, and 6 lb/A, pre-emergence only. The 3 and 4 pound rates gave very good control of grasses, good control of broadleaved weeds and wheat, with little damage to alfalfa. DNOSBP, alkanolamine salt (Premerge), at 2 and 3 lb/A killed nearly all vegetation. Sodium TCA at 4, 6, 8, and 10 lb/A gave very good control of grasses, good control of broadleaved weeds and wheat, with some damage to alfalfa at the 6 and 8 lb. rates. Results were nearly as good as with chloro-IPC. Damage was greatest to all vegetation when herbicides were applied at the time alfalfa was in the two-leaf stage, least damage when applied pre-emergence to alfalfa, with the four-leaf stage being intermediate.

Degree of damage is apparently more closely related to soil moisture and temperature than to stage of growth of young alfalfa. (Ohio Agricultural Experiment Station.)

Effect of chemicals upon the hay yields of clovers and alfalfa the year following treatment. Churchill, B. R. and B. H. Grigsby. Two years of data on the effect of chemicals for weed control in the year of seeding upon the hay yields the following year are shown in tables 1 and 2.

Table 1. 1951 Yields Following Spray Application in 1950

	% of check				
Treatment	Sweet clover	Ladino	Red	Alsike	Alfalfa
2,4-D 1/4lb. early (grain 6-8" high)	82	100	71	88	93
2,4-D 1/4lb late (grain in boot)	87	108	99	88	97
2,4-D 1/2 lb. early	83	96	99	96	92
2,4-D 1/2 lb. late	71	96	91	83	90
Dinitro 3/4 lb. early	95	87	107	90	89
Dinitro 3/4 lb. late	95	93	100	93	90
Check (not sprayed)	100	100	100	100	100

Table 2. 1952 Yields from Plots Sprayed in the Spring of 1951

	% of Check						
Treatment	Sweet clover	Ladino clover	Red clover	Red clover timothy	Alsike clover	Alfalfa	Alfalfa bromegrass
Endothal, 4 lb/A	61	6	95	90	44	79	62
TCA, 10 lb/A	82	88	46	46	34	90	95
Dow Selective - 3/4 lb/A	109	90	99	100	95	97	93
CMU, 1 lb/A	91	94	96	95	85	86	98
PCP, 8 lb/A	111	119	106	103	118	102	107
2,4-D, 1/2 lb/A	82	94	91	102	100	94	84
MCP, 1/2 lb/A	99	112	107	106	79	85	95
IPC, 4 lb/A	84	105	94	87	82	91	91
Check (not sprayed)	100	100	100	100	100	100	100

The most important results are the effects of endothal on ladino clover and the effects of TCA on red and alsike clovers.

In 1952, similar plots were sprayed with endothal 5 lb, MCP 1/2 lb, 2,4-D 1/2 lb, IPC 4 lb, TCA 10 lb, and combinations of these chemicals. Yields will be taken in 1953. Outstanding result of these treatments in 1952 was the increase in potency when chemicals were mixed. This was especially true when endothal, MCP and TCA were in the mixture. (Contribution of the Michigan Agricultural Experiment Station, East Lansing, Michigan.)

Effect of herbicides on seedling alfalfa. Forsberg, D. E. and H. A. Friesen. In a replicated test, the butyl ester, amine and sodium salt of MCP and a "mixed" amine of 2,4-D were sprayed on seedling alfalfa at dosages of 1/8 and 1/4 pound of acid equivalent per acre; the MCP amine was also sprayed at the 3/8 lb/A rate. Also included in this test was DNOSBP (ammonium salt) at dosages of 3 quarts in each of 40 and 80 gallons of water per acre.

RESULTS: Alfalfa plant counts were made immediately before treatment and recounts were made at the same location on each plot during the summer. None of the treatments resulted in any appreciable reduction in the numbers of seedlings. Because of delayed germination, the plant count on many of the plots was actually higher after treatment than it was before. There was no visible effect on the alfalfa plants as result of any of the treatments. The weed population consisted of wild buckwheat 60% and Russian thistle 40%. The MCP formulations resulted in unsatisfactory control of Russian thistle and wild buckwheat. The 2,4-D amine and the dinitros resulted in good control of Russian thistle but did not give a satisfactory control of wild buckwheat. (Contributed by the Dominion Experimental Station, Scott, Sask.)

Effect of herbicides in legume seedings. Hansen, J. R. and J. F. Freeman. Alfalfa, red and ladino clover were broadcasted and covered with a cultipacker on April 9, 1952. Soil was a silt loam. Herbicides and application rates were: CIPC and sodium salt of TCA at 2, 4, 8, and 12 lb/A and amine salt of DNOSBP at 1, 2, 4, and 8 lb/A. Each material at stated rates was applied 1, 11 (after legume emergence), and 27 days after planting. The experiment was a split-plot in design with four replications. The legumes were in whole plots with herbicides, rates, and application time in sub-plots. Three untreated checks were in each whole plot. Rain fell soon after the first treatment and occasionally during the following month. Good stands of legumes and a variety of broadleaved weeds and grasses emerged. Data on weed control and crop tolerance were taken in late June. Promising treatments included the DNOSBP at 2 and 4 lb, 27 days after planting, on all species for control of broadleaved weeds; TCA at 4 and 8 lb, 27 days after planting, for control of grasses in alfalfa; and CIPC at 4 lb, 27 days after planting for control of grasses and some broadleaved weeds. All herbicides were more injurious to legumes just after they had emerged. The clovers were more sensitive to TCA and CIPC than was alfalfa. Smartweeds were controlled by low rates of CIPC. (Kentucky Agricultural Experiment Station.)

Response of legumes to 2,4-D, MCP, and TCA. Miller, J. H. and R. S. Dunham. In 1952, the amine salts of 2,4-D and MCP at 1/4 and 1/2 lb. acid equivalent and sodium salt of TCA at 5 and 10 lb. acid equivalent per acre were applied to legumes as follows: Experiment 1 - alfalfa and red, alsike, ladino and sweet clovers seeded with flax; Exp. 2 - four varieties each of alfalfa and red and sweet clovers; Exp. 3 - two dates of application on established alfalfa and red and alsike clovers.

In Experiment 1, the application was made when the flax was about 6 in. tall and the red clover had 2 trifoliate leaves, alsike - 1, ladino 1 to 2, sweet - 1, and alfalfa - 3 to 4. Neither 2,4-D nor MCP at the 1/4 lb. rate importantly damaged any legume. The 1/2 lb. application of both 2,4-D and MCP injured all legumes. TCA did not injure alfalfa or sweet clover but caused moderate injury to ladino and serious injury to red and alsike clovers. Radish seeded with the legume and the naturally existing weeds (lambsquarters, pigweed, ragweed and mustard) were satisfactorily controlled by the 1/4 lb. rate of 2,4-D and MCP. Control of foxtail

was satisfactory with 5 lb. and excellent with 10 lb. of TCA. Thirteen comparisons of the amine salts of 2,4-D and MCP at the 1/4 lb. rate on seedling legumes have been made since 1950. In six cases, MCP showed a slight advantage while in 7 cases 2,4-D was somewhat less injurious.

In Experiment 2, the application was made when the legumes were 4-6 in. tall. The legumes treated were: Grimm, Ranger, Ladak and Cossack alfalfa; Midland, Wegener, Northern Commercial, and Wisconsin Mildew Resistant red clover; and Evergreen, Madrid, Commercial Late White, and Commercial Yellow sweet clover grown in cultivated rows. In 1951, there was a slight varietal response to herbicides but in 1952 no such indications were discernible. Very slight injury to the legumes persisted in 1952 except that TCA injured all varieties of red clover seriously.

In Experiment 3, applications were made in the spring when the legumes were 4-6 inches tall and immediately after harvest of the first hay crop. The early application did not reduce stands of any legume except red and alsike clovers sprayed with TCA where both 5 and 10 lb. applications caused severe reductions. There was some reduction in vigor for all treatments except TCA on alfalfa. At the second date of application, stands of alsike and red clover were not injured by 1/4 lb. rates of 2,4-D or MCP but alfalfa stands were decreased 20% by 2,4-D and 7% by MCP. The 1/2 lb. rates reduced stands of all legumes except 1/2 lb. of MCP on red clover. TCA did not injure alfalfa stands but alsike and red clovers were drastically reduced by 5 lb. and practically eliminated by 10 lbs. All treatments caused considerable reduction in vigor. These results for established stands are somewhat in variance with those of 1951 in that more stand injury and reduction in vigor were noted with the second date of application. (Contribution of Div. of Weed Investigations, BPIS&AE, U.S.D.A and Minn. Agri. Exp. Sta.) Paper No. 2921, Sci. Jour. Series of Minn. Agri. Expt. Sta.

The effect of herbicides on alfalfa and sweet clover. Olson, P. J., V. D. Burrows and G. Friesen. Grimm alfalfa and white blossom sweet clover were sown with Redman wheat (1 bu/A) and Dakota flax (30 lb/A.). When the legumes were 3-5 in. in height, the following treatments were applied: 4 and 12 oz. acid equivalent/A of MCP sodium salt; 4, 8 and 12 oz/A of MCP butyl ester; 2 and 4 oz./A of 2,4-D butyl ester; 4 oz/A of 2,4-D amine; and 1 gal. of Sinox in 60 gals. of water per acre. By observing the plots in the field the various treatments were placed into groups on the basis of the amount of damage done to the alfalfa and sweet clover. The treatments causing the least amount of damage were the one gal. rate of Sinox, 4 oz. rate of 2,4-D amine and the 2 oz. rate of 2,4-D ester. The second group consisting of 4 oz. of MCP sodium salt, 4 oz. of MCP ester and 4 oz. of 2,4-D ester were intermediate in the amount of damage caused. The last group caused severe stunting and curling of stems and leaves. They were the 8 and 12 oz. rates of MCP ester and the 12 oz. rate of MCP sodium salt. Sweet clover was slightly more susceptible than alfalfa. The alfalfa and sweet clover plants growing with flax were more vigorous than those growing with wheat. The experiment will be retained until the spring of 1953 for survival observations. In 1951, a similar experiment entitled "The effect of herbicides on legumes" was conducted and reported. The experimental plots were retained until the spring of 1952 for the purpose of determining the survival of alfalfa and sweet clover. The plots receiving the various treatments appeared to have fully recovered and could not be distinguished from one another, or from the check. (Contribution, Division of Plant Science, The University of Manitoba, Winnipeg.)

Effect of pre-emergence treatments of alfalfa, sweet clover and Russian pigweed with different herbicides, 1952. Pavlychenko, T. K. Russian pigweed (Axyris amaranthoides) is very prevalent in alfalfa and sweet clover grown for seed in Northern Saskatchewan. It is difficult to separate the seed of this weed from that of the legumes. To investigate the possibility of preventing the Russian pigweed from maturing seed in these crops, replicated plots were sown on clay loam soil and treated the next day with: 1, 2 and 3 lb/A rates of ethyl ester of 2,4-D (Weedone Concentrate), amine salt of MCP (Weedar MCP), acetanilide of 2,4-D (ACP646A), mixtures of esters of 2,4-D, 2,4,5-T and para (ACP912), mixture of acids 2,4-D and 2,4,5-T (ACP926), micronized wettable acid of 2,4-D (ACP472); 2 and 4 lb/A rates of 3-p-chlorophenyl-1-1-dimethylurea (CMU); 6, 12 and 18 lb/A rates of isopropyl-n-(3-chlorophenyl) carbamate (CIPC) and 10, 15 and 20 lb/A rates of potassium cyanate (KCNO) and sodium salt of TCA. All chemicals were sprayed in 35 gal/A of water, except for ACP646A, which was sprayed in the same amount of Diesel oil. Growing conditions were favorable throughout the season.

RESULTS: All the chemicals used with the exception of CIPC and TCA permitted a reasonably good emergence of both legumes. The germination and growth in Russian pigweed was also practically normal. For this reason, the treatments may be regarded as agronomically impractical. CIPC and TCA were highly effective in preventing seed production of Russian pigweed, but they were still more injurious to the legumes. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

Effect of post-emergence treatments on legumes, Russian pigweed and green foxtail with various herbicides, 1952. Pavlychenko, T. K. Replicated plots of alfalfa (Medicago sativa), sweet clover (Melilotus officinalis), Russian pigweed (Axyris amaranthoides) and green foxtail (Setaria viridis) were treated on clay loam soil when alfalfa, sweet clover, green foxtail, and Russian pigweed were 2 1/2, 2 1/2, 3 and 6 in. high respectively. The rates used were: 2 and 4 oz/A of ethyl ester (Weedone Concentrate), butoxy ethanol ester (LV4), and amine salts (Weedar 64 and ACP127) of 2,4-D, amine salt of MCP (Weedar MCP); 2 and 4 lb/A rates of isopropyl-n-(3-chlorophenyl) carbamate (CIPC) and 15 and 20 lb/A of NaTCA.

RESULTS: At the 2 and 4 oz/A Weedone Concentrate reduced the dry wt. of alfalfa by 5 and 11%, sweet clover - 0 and 33%, and Russian pigweed 53 and 80%; LV4 - 0 and 0 (alfalfa), 35 and 16 (sweet clover) and 39 and 78% (Russian pigweed). Weedar 64 was fully tolerant to alfalfa and sweet clover, but also permitted seed production of the weed. ACP127 and Weedar MCP were highly tolerant to the crops but also to the weed. Chloro IPC caused no significant reductions in alfalfa, sweet clover or Russian pigweed at the 2 lb/A rate, but at the 4 lb/A rate, 22, 17 and 21% reductions for the 3 species were recorded. NaTCA was too severe on the two legumes (20 and 42% reduction in wt.) and also prevented Russian pigweed from producing seed. NaTCA was the only chemical to cause severe injury to green foxtail with 54 and 90% reduction in wt. at the 15 and 20 lb/A rates. It appears from this work that both ethyl and butoxy ethanol esters at the proper rates offer some promise for controlling Russian pigweed in alfalfa. Further research is needed. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

Results of 2,4-D and MCP treatments on an established mixed legume stand. Waywell, C. G. In May, 1951, 2,4-D amine at 4, 6, 8 and 16 oz/A., 2,4-D butyl ester at 4, 6, and 8 oz/A., MCP butyl ester at 4, 6, 8 and 16 oz/A., and MCP sodium salt at 4, 6, and 8 oz/A were applied to an established mixed legume stand (Ladino clover, Alsike, red clover and alfalfa). A 20 gal/A rate was used on all plots. Four replicates were used for each treatment. The severity four days after treatment and the stands 2 months later as well as those for 16 months later are expressed as percent of the check plots and are recorded in the table. Each figure is the average of four replicates.

Chemical	oz/ acre	Severity + 4 days	% stand + 2 mos.	% stand + 16 mo.	Chemical	oz/ acre	Severity + 4 days	% stand + 2 mos.	% stand + 16 mo.
2,4-D	4	3.0	26	16	MCP	4	2.0	81	84
butyl	6	3.5	12	14	sodium	6	3.0	82	84
ester	8	4.0	6	9	salt	8	2.0	71	77
2,4-D	4	2.0	47	59	MCP	4	3.0	31	34
amine	6	2.5	41	57	butyl	6	3.0	30	14
	8	3.0	25	66	ester	8	3.0	10	16
	16	4.0	12	40		16	4.0	10	14
Check	-	0.0	100	100	Check	-	0.0	100	100

Severity: 0 = none, 2 = slight, 3 = moderate, 4 = severe

All treatments reduced the yield of forage but the MCP sodium salt caused less damage on all plots. The reduction in stand was not overcome the following year. (Contributed by Dept. of Botany, Ontario Agricultural College, Guelph, Ontario, Canada.)

Effect of 2,4-D and MCP on alfalfa. Waywell, C. G. Two 7 x 7 Latin square tests were laid out in a pure stand of common variegated alfalfa. One test was treated after the first cutting when the regrowth was 4-5 inches high. The second was applied when the regrowth was about 10 inches high. The field had been in alfalfa for 5 years. Treatments were applied with a hand sprayer at a rate equivalent to 20 gal/A. The treatments used are shown in the table. Yard square clip quadrats were taken 7 weeks after treatment in Test I and 6 weeks after treatment in Test II. The samples were then oven dried and weighed.

Treatment	oz/Acre	Test I (gms.)*	Test II (gms.)*
2,4-D butyl ester	4	1.80	2.66
2,4-D amine	4	3.04	4.07
	8	2.12	1.64
MCP sodium salt	4	3.18	3.48
	8	1.73	3.15
	12	2.06	1.92
Check	-	6.20	5.40

* Average of 7 plots.

All treatments at both stages of growth reduced the yield of alfalfa. There was no significant difference between the2,4-D amine and MCP sodium salt at 4 or 8 oz/A. Winter injury across the whole field made it inadvisable to continue observations in 1952. (Contributed by Dept. of Botany, Ontario Agricultural College, Guelph, Ontario, Canada.)

Chemical control of Downy brome grass (Bromus tectorum L.) in an established alfalfa field. Wiltse, Mark G. and Boyd R. Churchill. TCA, sodium salt, and IPC were applied to an established field of alfalfa that was infested with downy bromegrass and a small amount of Kentucky bluegrass. IPC was applied at .5, 2.5, 5 and 10 lb/A and the TCA was applied at .9, 4.5, 9, and 18 lb/A. The chemicals were applied in 90 gal. of water per acre, except that the IPC applied in the spring was in 135 gallons. TCA gave poor control based on visual estimates at .9 and 4.5 lb/A rate in both the spring and fall applications. IPC gave medium control at the .5 lb/A rate in both the spring and fall applications, and at the 2.5 lb/A rate applied in the spring. When 2.5 lb/A of IPC were applied in the fall, excellent control was obtained; only .07% downy bromegrass remained in the dry weight sample. IPC gave excellent control in the fall and spring applications at the 5 and 10 lb/A rates. The downy bromegrass in the plots sprayed in the spring was stunted (5 inches high) but headed out. The Kentucky bluegrass was stunted and did not head out in the plots sprayed with 5 and 10 lb/A rate applied in the fall. TCA approached excellent control in only the 18 lb/A rate applied in the fall. IPC and TCA gave slight injury to alfalfa when applied at the highest rates. Spring applications of the herbicides significantly decreased the alfalfa yields when compared with the fall applications. The alfalfa yields for the sprayed plots were higher than those for the check plots. Experiments indicate that applying the herbicides earlier in the fall may give better control when soil moisture causes early germination of the downy bromegrass. (Contribution of Michigan Agric. Exp. Station, East Lansing, Michigan.)

Effect of the time and rate of application of TCA on the number and dry weight of Downy brome grass plants. Wiltse, Mark G. and Boyd R. Churchill. Fifty downy bromegrass seeds were seeded on 1 sq. yd. plots on April 22, 1952 at East Lansing, Michigan. The soil was a clay loam. TCA, sodium salt, was sprayed on replicated plots at seeding time, at emergence (May 6th), two weeks after emergence (May 20th), and four weeks after emergence (June 3rd) at 4.5 and 9 lb/A. Seedling counts were made on June 23 and the plants cut off at ground level, dried, and weighed. The 9 lb/A reduced the number of plants per plot more than the 4.5 lb/A rate except when applied two weeks after emergence. The number of downy bromegrass plants was least, at both rates, when the herbicide was applied at seeding time. There were more plants when the herticide was applied two weeks after emergence than when applied four weeks after emergence. This may have been due to the fact that rain fell on six consecutive days after applying the herbicide at the two-weeks-after-emergence stage. The total amount of rain in this period was 3.3 in. The total dry weight of the downy bromegrass plants was least when the TCA was applied at seeding time. The 9 lb/A rate reduced the total dry weight more than the 4.5 lb/A rate. The greatest dry weight was produced, at both rates, when sprayed two weeks after emergence. At the 9 lb/A rate, the dry weight per plant was the least when the TCA was applied at seeding time. At the 4.5 lb/A rate, it was the least when applied four weeks after emergence. (Contribution from Michigan Agric. Exp. Station, East Lansing, Michigan.)

WEEDS IN PASTURES

Summary

Dayton L. Klingman

In a comparison of methods of weed control in pastures at Lincoln, Nebraska, plowing and reseeding to grass (plus 2,4-D) was most effective in controlling weeds, the use of 2,4-D was next in effectiveness, and mowing was relatively ineffective (except for ragweed following the two years of comparison).

Pasture sage, sprayed with various formulations of 2,4-D and 2,4,5-T in Canada, had top growth substantially killed by all chemicals. Varying the formulation of the same chemical apparently gave differential results.

One-hundred farmer co-operators report highly encouraging results from spraying western snowberry, S. occidentalis, and other offending growth with 1½ lbs. 2,4-D per acre in Canada. About 65% report some improvement in grass stands following treatment.

Abstracts of Results of Cooperators

A comparison of weed control methods in a weedy farm pasture. Klingman, Dayton L. An experiment comparing (1) mowing, (2) 2,4-D, (3) plowing and reseeding to grass (plus 2,4-D) and (4) check, in a weedy farm pasture has been under way since 1950. Data taken in June prior to 1952 weed control treatments indicate that the total population of all weedy perennials was not greatly influenced by either date of mowing, was reduced 58 and 40% respectively by early June and early July spraying with 2,4-D, and the three reseeded plots (plus 1/4 and 1/2 lb. 2,4-D) gave from 71 to 89% reduction. Treatments giving over 50% reduction in annual weed populations were: (1) mowed early July, (2) 2,4-D early June, (3) 2,4-D early July, (4) smooth bromegrass (plus 2,4-D), and (5) warm season grass mixture (plus 2,4-D). Individual species reaction can best be shown in tabular form:

Treatments	Percentage of check stands					
	Ironweed	False Boneset	Hoary Vervain	Yarrow	Many-flowered aster	Annual ragweed
	%	%	%	%	%	%
Check	100	100	100	100	100	100
Mowed early June	73	106	141	231	81	82
Mowed early July	104	120	79	213	45	24
2,4-D early June	23	95	35	48	3	42
2,4-D early July	48	64	21	62	1	37
Intermediate wheat (plus 2,4-D)	1	8	25	23	1	60
Bromegrass (plus 2,4-D)	1	6	20	21	5	26
Warm-season grasses (plus 2,4-D)	4	3	28	75	3	14

(Contributed by the Division of Weed Investigations, B.P.I.S.A.E., U. S. Department of Agriculture and the Nebraska Agricultural Experiment Station cooperating.)

EFFECT of Systemic Herbicides on Pasture Sage, 1952. Pavlychenko, T. K. and Bestrop, A. J. Plots 8 x 100 ft. in size, of Pasture Sage (Artemisia

frigida) in brome grass overgrazed pasture were treated in the late flowering stage with 1½ and 3 lb/A rates of ethyl esters of 2,4-D (Weedone Concentrate and Weedone Concentrate "Dilute"), low volatile butoxy ethanol esters of 2,4-D (Weedone LV4, Weedone LV4 "dilute" and ACP129), pentasyl ester of 2,4-D (ACP649), amine salt of 2,4-D (Weedar 64), amine salt of MCP (Weedar MCP), mixture of 2,4-D and 2,4,5-T esters (Brush Killer 32), acids of 2,4-D and 2,4,5-T (ACP926), ester of para (ACP903) and ester of MCP (ACP904). Moisture conditions were fair throughout the season.

RESULTS: All the chemicals used gave substantial kill of the top growth, but varied considerably in preventing regrowth from roots and seed setting of the surviving plants. The most effective chemicals were Weedone LV4, ACP129, Weedone Concentrate "Dilute" and ACP649. These produced nearly 100 pct. defoliation and killed stems 82 to 95 pct. Whatever regrowth from the roots occurred it was abnormal with many leaves dead or discoloured. Weedone Concentrate, BK32, ACP926 and Weedone LV4 "Dilute" were the next in effectiveness. These also gave from 63 to 92 pct. top kill, but regrowth was less affected than in the above group. The least effective chemicals were ACP904, Weedar MCP, ACP903, and Weedar 64. The top kill was only from 30 to 74 pct., regrowth quite general and almost normal. Weedar MCP also permitted seed setting by the surviving plants. The best treatments practically eliminated and the other chemicals considerably reduced competition and shading of pasture by the weeds. This helped the brome grass to increase its stand. Final record will be taken in 1953.

Effect of Systemic Herbicides on Pasture Sage, 1952.

Treatment	Rate lbs/A	stem kill %	Regrowth
WC	1½ - 3	90 - 95	abnormal
WC "Dilute"	"	"	"
Weedone LV4	"	92 - 98	"
LV4 "Dilute"	"	50 - 75	"
ACP129	"	90 - 90	"
ACP649	"	80 - 85	"
Weedar 64	"	30 - 30	normal
Weedar MCP	"	42 - 40	"
BK32	"	62 - 77	abnormal
ACP926	"	65 - 75	normal
ACP903	"	30 - 30	"
ACP904	"	77 - 72	abnormal

(Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

NOTE: WC - Weedone Concentrate. WC"Dil" - Weedone Concentrate reduced to concentration of 9.6 pct. ac. eq. Weedone LV4 - butoxy ethanol ester of 2,4-D. Weedone LV4 "Dilute" - butoxy ethanol ester of 2,4-D reduced to concentration of 9.6 pct. ac. eq. ACP129 - butoxy ethanol ester of 2,4-D. ACP649 - pentasyl ester of 2,4-D. Weedar 64 - amine salt of 2,4-D. Weedar MCP - amine salt of MCP. BK32 - mixture of butoxy ethanol esters of 2,4-D and 2,4,5-T. ACP926 - mixture of acids of 2,4-D and 2,4,5-T. ACP903 - esters of para. ACP904 - ester of MCP.

CONTROLLING western snowberry and other offending growth in native pastures with 2,4-D. Wood, H. E.; Howden, J. S. Through the assistance of Agricultural Representatives, 100 farmer co-operators with pastures heavily infested with Western Snowberry, Symphoricarpos occidentalis, and often other woody and weed growth, each undertook to spray approximately two acres, using 2,4-D butyl ester provided for the project by a leading chemical company. Application was made with farm sprayers using approximately 5 imperial gallons water and 1½ lbs. acid per acre; spraying was done from late May through June, in most cases before the snowberry flowered. At time of spraying, generally the weather was dry, but not unduly hot. Sufficient reports to hand in general indicate very satisfactory results. In rating "kill" obtained, the range was from an occasional one as low as 50% to some almost 100%, an average of 80%. Most co-operators felt re-spraying in 1953 should give about complete eradication. About 65% of the co-operators indicated some improvement in the stand of grass following treatment. In late June, in Winnipeg, a few hours after a 1.9 inches rain square rod plots of dense snowberry in bud were knapsack sprayed at the rate of 1½ lbs. acid per acre using 1 imp. gal. water, whereby a standard 2,4-D butyl ester was compared with a low volatile ester of 2,4,5-T. By October a nearly complete "kill" was obtained on both plots, even though earlier in the season the 2,4-D plot looked rather more promising. (Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada.)

Effect of herbicides of pasture sage (Artemisia frigida). Friesen, H. A. The isopropyl ester and alkanolamine amine of 2,4-D and an ester of 2,4,5-T were sprayed on sage growing in an overgrazed native grass pasture. Each formulation was applied at dosages of ¼, ½, 1 and 2 pounds of acid equivalent per acre. Sodium TCA was also applied at dosages of 20, 40, 60, 80, and 100 lbs. per acre. The treatments were made early in August of 1950. Results: In 1950 the TCA at each dosage killed the grass and discolored the sage. The 2,4-D and 2,4,5-T treatments caused a pink discoloration of the sage but had no visible effect on the grass. In 1951 each of the TCA treatments had completely killed the grass but the sage had resumed its normal color and growth. 2,4-D ester and amine at dosages of 1 and 2 pounds had reduced the stand of sage by 95 and 100 percent. The ester of 2,4,5-T at comparable rates reduced the stand by only 65 and 70 percent. The 2,4-D ester at the ¼ and ½ pound rates reduced the stand of sage by 80 and 95 percent. The 2,4-D amine and the 2,4,5-T ester were 15 and 35 percent less effective, respectively, at comparable rates. In 1952 there was essentially no regrowth of sage on the 2,4-D ester and amine plots treated at 1 and 2 pounds per acre. However, on the 2,4-D ester and amine plots sprayed at ¼ and ½ pound rates and 2,4,5-T at all rates the regrowth approached 80 per cent of the original stand. The TCA plots were completely covered with sage to the exclusion of the grass. The plots were heavily grazed throughout the course of this test, nevertheless, there was evidence of an increase in the stand and vigor of the grass on those plots where the sage competition had been removed. (Contributed by the Dominion Experimental Station, Scott, Sask.) 1952.

ONIONS, POTATOES, AND SWEET CORN

Summary — R. E. Nylund

Twelve abstracts on weed control in onions, three on potatoes, and one on sweet corn were received.

Of the large number of herbicides tested for pre-emergence weed control in onions on muck soils only Stoddard Solvent, KCNO, and sulphuric acid consistantly gave good weed control without crop injury. CMU, which was tested most extensively, gave good weed control without crop injury when used at rates up to 2 lb. per acre in five of six tests reported. In one test rates as low as 1/2 lb. reduced onion stands. The toxicity of CMU to both weeds and onions is apparently affected by the amount and distribution of rainfall following application. CIPC at rates from 4 to 12 lbs. also appears to have promise as a residual pre-emergence herbicide controlling most common muckland weeds except lambsquarters and pigweed without injury to onions. In two of three tests 2,4-D gave fair to good weed control without crop injury; in the third, where onions were planted shallow, stands and yields of onions were reduced. Sodium isopropyl xanthate in one test gave poor weed control, in another good weed control without crop injury. Certain combinations of chemicals appear to have promise as pre-emergence herbicides for onions, i.e., CIPC plus Stoddard Solvent and CMU plus endothal. Other chemicals tested but found to be either toxic to onions or non-toxic to weeds at the rates used are SES, sodium monochloroacetate, calcium cyanamid, Esso No. 45, endothal, and N-1 naphthyl phthalamic acid.

Post-emergence applications of herbicides to onions gave variable results depending on chemical, dosage, and stage of onions when treated. KCNO at 16 lbs., CMU at 1 and 2 lbs., and 2 1/2% sulphuric acid gave good control of broad-leaved weeds without crop injury when applied to onions in the flag or one-leaf stage. CIPC, from results of one test, appears promising as a selective weedicide for onions in the 2-3 leaf stage. Likewise, a mixture of CIPC and KCNO gave good weed control without crop injury when applied to onions in the flag stage. DNOSBP, sodium isopropyl xanthate, endothal, sulphuric acid, CMU, and KCNO all show promise for use as basal sprays in older onions. In over-the-row sprays on young onions herbicides such as SES, N-1 naphthyl phthalimide, sodium isopropyl xanthate, and sodium monochloroacetate either gave poor weed control or were toxic to onions at the rates used.

Reports on pre-emergence weed control studies on potatoes indicate that SES, 2,4-D, and a mixture of 2,4-D and 2,4,5-T were non-toxic to potatoes and gave good weed control. CIPC and CMU, on the other hand, while giving good weed control, seriously reduced yields of potatoes at the rates used. MCP as a post-emergence treatment controlled stinkweed but not Russian thistle and did not injure potato plants.

In the one abstract on sweet corn received, SES at 3 lbs. is reported to have given good control of weeds when applied as a pre-emergence treatment on silt loam soils provided the soil was not dry at the time of application. Higher rates caused some malformation of brace roots.

Abstracts of Results of Cooperators

Pre-emergence studies with SES and four vegetable crops. Alban, E. K. During the 1951 and 1952 seasons, pre-emergence sprays of 1.0, 2.0, 3. 0, and 4.0 lbs. of SES were applied over direct-seeded onions, sweet corn, potatoes, and

asparagus plants grown on Brookston and Miami silt loam. In most instances irrigation was available, but in two of the tests supplemental water was not available. All crops revealed a fairly high degree of tolerance with the exception of onions at the 3.0 and 4.0 lb. rate/acre. There was also some slight malformation of brace roots of sweet corn at the 4.0 lb. rate. Effective control of weeds was not obtained with the 1.0 or 2.0 lb. rates per acre SES, and where the soil surface at time of application was rather dry and course the 3.0 and 4.0 lb. rates were inadequate. Where moisture was controlled, both the 3.0 and 4.0 lb. rates provided good weed control comparable to 1.0 to 1.5 lb. AE of the alkyl esters of 2,4-D. (The yields of sweet corn and potatoes at the higher rates of SES were comparable to the 1.0 to 1.5 lb. AE 2,4-D plots). Canada thistle (Cirsium arvense) was not controlled in asparagus plantings at even the 4.0 lb. rate of SES, but most annual grasses and broad leaf weeds were controlled. (Ohio Agricultural Experiment Station.)

Effect of MCP on potatoes. Dabbs, D.H. and Friesen, H.A. Irish cobbler and Warba varieties of potatoes were sprayed with MCP butyl ester at a dosage of 8 ounces of acid equivalent per acre. At the time of spraying the potatoes were some 8 inches tall but had not yet begun to bud. The stinkweed was in the early bud stage and the Russian thistle had well developed side branches. Results: The spray killed almost 100 percent of the stinkweed plants but had essentially no effect on the Russian thistle. There were no observable effects on the potato plants, either vines or leaves. Flowering was normal and maturity of the tubers was not delayed. The yield of potatoes was not affected by the treatment. The lack of yield differences between the treated and untreated potatoes may be explained by the lateness of the spraying and the mechanical weeding of the untreated check. (Contributed by the Dominion Experimental Station, Scott, Sask.)

Pre-emergence weed control in onions. Lana, E.P. and Staniforth, D.W. Early control of weeds by pre-emergence treatments on peat soil was good with 2,4-D ester 1/2 and 3/4 lb/A, 2,4-D amine 1/2 and 3/4 lb/A, CMU 1/2, 1 and 2 lb/A, and Chloro IPC 4 and 8 lb/A. Onion stand was reduced by all rates of CMU. SES sodium salt at 1 lb/A did not give satisfactory weed control. The pre-emergence treatments were effective in controlling weeds for about 3 weeks from application period (May2). A 1% soln. of KCNO applied as a post-emergence treatment did not give satisfactory weed control. E.H.3 when used as a selective post-emergence treatment indicated some promise. Applications up to 30 gal/A applied in 10 gal. lots controlled weeds throughout the season without any cultivation. Foliage injury was characterized by a dying back of the tips of the onion leaf. Yields decreased as dosage and gallonage increased. E.H.3 applied in two doses of 5 and 10/A did not reduce yields and only three cultivations were necessary as compared to 8 for the control. (Iowa Agricultural Experiment Station, Ames, Iowa)

Weed control in onions with post-emergence directional sprays. Larsen, John and Warren, G.F. Early Yellow Globe onions in the 4 to 5 leaf stage growing on muck soil were given the following treatments on June 24: KOCN, 20 lb/A; sodium isopropyl xanthate, 8, 12 and 16 lb: endothal (with ammonium sulfate), 2 lb; DNOSBP (in oil carrier), 1 lb; sulfuric acid 2½% and 5%. All treatments were applied both with and without a wetting agent in water at 100 gal/A. A special sprayer with nozzles mounted on floats applied the spray to both sides of each row so that only the basal 0 to 2 inches of the onion plants were hit by the spray. The maximun temperature on the day of treatment was 97°F, the sky was clear and there was no rainfall during the following week. The weeds present were mostly from 1 to 3 inches tall. Nearly all the treatments gave considerable control of purslane (Portulaca oleracea) and pigweed (Amaranthus retroflexus) but none gave fully satisfactory control of the annual grasses (mostly Panicum spp.) In general, weed control was considerably improved by the addition of the wetting agent. The

onions showed little or no injury as a result of any of the sprays when used without a wetting agent. When the wetting agent was added, however, endothal and all sodium isopropyl xanthate treatments caused considerable damage to the onions, while 5% sulfuric acid and DNOSBP resulted in slight injury. (Department of Horticulture Purdue University, Agricultural Experiment Station, Lafayette, Indiana.)

Control of weeds in onions by pre-emergence applications of herbicides. Nylund, R.E. Brigham Yellow Globe onions were seeded on muck soil on April 23, 1952. Eight days later, on May 1, the following herbicides were applied: (1) CMU at 1 and 2 lb active ingredient per acre, (2) Stoddard Solvent at 80 gal. per acre, (3) Esso No. 45 (Penola Weed Killer) at 20 gal. per acre, (4) KCNO at 16 and 20 lb. per acre with and without the addition of a wetting agent (0.1% Dreft). Each herbicide was applied to five replications of single row plots one rod long using a knapsack sprayer operated at 30 psi pressure and fitted with a fan-type nozzle. The sprayer was operated so as to cover the entire land area of each plot. The onions at the time of application had sprouts up to 1 inch long but had not emerged. Emergence began two days later. Emerged weeds, at the time of herbicide application were few and mostly in the cotyledon stage. The soil was moist in spite of the fact that no rain had fallen for 11 days prior to herbicide application. The first rain following herbicide applications fell on May 7, at which time 0.48" was recorded. Temperature at time of application was 75°F. and humidity was 48%. Weed counts, made two weeks after herbicide application, showed that all herbicides had significantly reduced the weed population. Percent weed control by the various treatments was as follows: 1 lb. CMU (78%), 2 lb. CMU (82%), Stoddard Solvent (68%), Esso No. 45 (40%), 16 lb. KCNO (58%), 16 lb. KCNO plus wetting agent (66%), 20 lb. KCNO (59%), 20 lb. KCNO plus wetting agent (64%). None of the treatments caused apparent damage to the onions. However, due to a heavy infestation of onion maggot which occurred starting on June 10 which seriously reduced stands, it was impossible to obtain accurate yield records. (Paper No.2918 of the Scientific Journal Series of the Minn. Agr. Exp. Sta.)

The influence of date and time of application on the effectiveness of CMU as a pre-emergence herbicide for onions. Nylund, R.E. Brigham Yellow Globe onions were seeded on muck soil on April 23 and on May 6. CMU was applied at rates of 1/2, 1, and 2 lb. active ingredient per acre to single row plots one rod long on the day of seeding and to other plots 3, 6, and 9 days after seeding in both plantings. Each treatment was replicated five times. In the early planting a few weeds were present and in the cotyledon stage at the 6th and 9th day treatments, but while onions had sprouts up to 1 inch long at the time of the 9th day treatment no onions had emerged. In the early planting temperatures were 59, 73, 75 and 75°F. at the time of the 0, 3, 6, and 9th day treatments, respectively. In the late planting, temperatures at time of application were somewhat lower, being 60, 54, 53, and 52°F. at the time of the 0, 3, 6 and 9th day treatments, respectively. No weeds or onions had emerged at the time of the last application. Rainfall during the period from 3 days prior to the first application to 6 days after the final application was 0.73" for the early planting and 1.18" for the late planting. Broadleaved weeds and grasses were counted 8 and 14 days after the 9th day application in each planting. Due to serious maggot damage no onion stand or yield data were obtained for the early planting, but such data were obtained for the late planting at harvest. In general, rates of 1/2 or 1 lb. of CMU gave somewhat poorer weed control than did 2 lb. of CMU. This was true in both plantings. However, the time of applications of CMU which gave maximum weed control varied in the two plantings. In the early planting, each 3 days delay in application after seeding resulted in increased weed control. In the late planting, however, weed control was as good when the CMU was applied on the day of seeding as when treatment was delayed for 9 days. This difference may have been due to the fact that more rain

fell in the period immediately following applications in the late planting than did in the early planting, thus washing the CMU down to the germinating weed seedlings. That CMU has considerable residual effect is indicated by the fact that the weeds present in the treated plots did not increase in number between the 8th and 14th day after the final treatment while in the untreated plots weeds increased in numbers during that period. In the early planting, 2 lbs. CMU applied 9 days after seeding gave 68% weed control in 8 days and 80% in 14 days. In the late planting, the same rate and time of application of CMU gave 61% 8 days after and 69% 14 days after application. In the late planting, none of the CMU treatments significantly affected stands or yields of onions. (Paper No. 2919 of the Scientific Journal Series of the Minn. Agr. Exp. Sta.)

Post-emergence weed control in onions. Nylund, R. E. Brigham Yellow Globe onions seeded in muck soil on April 23 were sprayed when in the early one-leaf stage (May 15) with the following herbicides. KCNO at 8, 12, and 16 lbs. active ingredient per acre; CMU at 1 and 2 lbs. active ingredient per acre; Endothal 3003 at 4 lb. per acre (2 gal formulation per acre) and DNSOBP at 1.875 lbs. per acre. All herbicides were applied over the row in 100 gal water per acre at 30-35 lbs. pressure using a knapsack sprayer fitted with a flat-fan nozzle. Each plot consisted of a single rod row. All treatments were replicated five times. Temperature at time of application was 52°F; relative humidity was 55. Approximately one-half inch of rain fell on the day before application; no rain fell for twelve days following application. Broad-leaved weeds and grasses were counted 6 and 13 days after application. None of the treatments gave any significant control of grass weeds which consisted mainly of foxtails (Setaria glauca and Setaria viridis). All of the treatments with the exception of 8 lbs. KCNO gave highly significant control of broad-leaved weeds which consisted principally of pigweed (Amaranthus retroflexus), lambsquarters (Chenopodium album) and common purslane (Portulaca oleracea). DNOSBP, although an effective weed killer, caused serious injury to the onion plants. None of the other herbicides caused noticeable injury to the onions. However, due to maggot infestation, final stands and yields of onions were unobtainable. Of the treatments which apparently did not injure onions the two which gave best weed control were 16 lbs. KCNo and 2 lbs. CMU. These had given 59% and 52% weed control, respectively, six days after application and 52% and 77% weed control, respectively, thirteen days after application. The CMU apparently was slower to kill but had a longer residual effect.

In another test, CMU at 2 lbs. per acre gave excellent control of purslane without crop injury when applied as a basal spray to onions in the 8-10 leaf stage. (Paper No. 2917 of the Scientific Journal Series of the Minn. Agr. Exp. Sta.)

Effect of Pre-emergence treatments on Potatoes with various herbicides, 1952. Pavlychenko, T. K. Replicated plots of Early Ohio potatoes were treated nine days before emergence with: 1 and 2 lb/A rates of ethyl ester (Weedone Concentrate), acetanilide (ACP646A) and butoxy ethanol ester (LV4) of 2,4-D, mixture of acids of 2,4-D and 2,4,5-T (ACP926); 2 and 4 lb/A of 3-p-chlorophenyl-1-1-demethylurea (CMU, and with 6 and 12 lb/A of isopropyl-n-(3-chlorophenyl) carbamate (CIPC). All the treatments were made in 35 gal/A of water, except for ACP646A, applied in the same quantity of Diesel oil. The land was heavily infested with Russian thistle (Salsola Kali), and stinkweed (Thlaspe arvense). The plots were left without any cultivation for four weeks after the treatment. RESULTS: CIPC at the 3 rates used was very effective in destroying or stunting weeds (60 to 70 pct.), but it also killed the crop soon after emergence. The mixture of 2,4-D and 2,4,5-T acids gave 65 to 72 pct. weed kill and produced the highest increases in yields of 46 and 28 pct. at the 2 rates used. Weedone (LV4 at 1 lb/A was the next best with 41 pct. yield increase. Weedone Concentrate gave the best weed

control but yield increases were lower, namely 24 and 8 pct. at the 1 and 2 lb/A rates. ACP646A gave highly effective weed control and a yield equal to check at 1 lb/A rate and 20 pct increase at 2 lb/A rate. This chemical has caused quite noticeable curling on the apical leaves of potatoes, but no injurious effect on the chlorophyll. CMU destroyed up to 70 pct. of weeds, but also depressed crop yields by 6 and 12 pct. at the 2 and 4 lb/A rates. The effective treatments all eliminated at least one weeding operation that otherwise was needed. (Contributed by Agr. Div., American Chemical Paint Co., Saskatoon, Sask.)

Pre-emergence sprays for weed control in onions. Shadholt, C.A. and Holm, L. G. Brigham Yellow Globe onions were sown on an organic soil on May 9, and all plots were treated on May 13. Treatments consisted of: CIPC (isopropyl-N-3-chlorophenyl) carbamate) at 2, 4 and 6 pounds; CMU (3 parachlorophenyl-1-1-dimethylurea) at 1, 2, and 3 pounds; Endothal (3, 6-endoxohexahydrophthallic acid) at 3 and 6 pounds; Calcium cyanamide at 75 pounds; SES (sodium 2,4-dichlorophenoxyethyl sulfate) 3 pounds; and various combinations of CMU and Endothal. Rates of chemicals are expressed in pounds per acre on the basis of acid equivalent or active ingredient, and all except the cyanamide dust were applied in 40 gallons of solution and at a pressure of 30 pounds. Weed and stand counts were taken on June 16, and yields on September 2. CIPC at 4 and 6 pounds resulted in greater than 95% control of smartweed (Polygonum Persicaria) but no control of pigweed (Amaranthus retroflexus) was obtained at any rate. CMU at 2 and 3 pounds gave 87 and 97% control respectively of pigweed, but controlled only 36, and 83% respectively of smartweed. A mixture of 2 pounds of CMU with 2 pounds of Endothal gave excellent control of all weeds. Endothal, cyanamide, and SES gave unsatisfactory weed control. The yields of the treated plots compared favorably with those of the checks, except the Endothal 6 pounds, SES, and the mixture of CMU 2 pounds with endothal 4 pounds which resulted in a 12% reduction. The only reductions in stand occurred with CMU 3 pounds, and the mixture of CMU 3 pounds with Endothal 4 pounds which reduced the stand by 27 and 20% respectively. This experiment indicates that CIPC is effective against smartweed in onions, whereas CMU controlled the pigweed, but was much less effective on the smartweed. (Department of Horticulture, University of Wisconsin, Agricultural Experiment Station, Madison, Wisconsin.)

The use of CMU for pre-emergence weed control in onions. Shadbolt, C.A. and Holm, L.G. Brigham yellow globe onions were planted on June 25, in a four replicated randomized block experiment on organic soil. Application of $1\frac{1}{2}$, $2\frac{1}{2}$, $3\frac{1}{2}$, and $4\frac{1}{2}$ pounds of CMU (3-p-chlorophenyl-1-1-dimethylurea) (active ingredient) was made on the day following planting, and on other plots 7 days after planting just as the onions emerged from the soil. The chemical was applied in 40 gallons of solution under a pressure of 30 pounds. Weed counts were taken on July 16, and the stand counts on July 30. There was a highly significant reduction in weed stand with all treatments. The application of CMU at crop emergence gave somewhat better control than similar application at the time of planting. Weed control at $1\frac{1}{2}$ through $4\frac{1}{2}$ pounds of CMU applied at emergence was: 69, 86, 92, and 94% respectively, and when applied at planting, 63, 70, 75, and 75%. A total of only .25 inches of rain fell in the three weeks following planting, and at the end of this time, onion stands showed no reduction at any of the rates of CMU. Between the third and fifth week following planting 6.88 inches of rain fell, after which time, the onion stand was reduced at the $3\frac{1}{2}$ and $4\frac{1}{2}$ pound rates by 30% in the emergence application and 15% by the planting application. It appears from this experiment that CMU at approximately 2 pounds per acre has considerable promise for pre-emergence as a herbicide in onions, and warrants further experimentation. It is also apparent that factors such as precipitation and time of application have profound effects upon its herbicidal properties. (Department of Horticulture, University of Wisconsin, Agricultural Experiment Station, Madison, Wisconsin.)

Post-emergence weed control in onions. Shadbolt, C. A. and Holm, L. G. Brigham yellow globe onions were sown on June 25 on an organic soil in a four replicated randomized block experiment. On July 15 when the onions were in the advanced flag stage the following treatments were made: CMU (3-p-chlorophenyl-1-1-dimethylurea) 1, 2, and 3 pounds; endothal (3,6-endoxohexahydrophthallic acid) 3 and 5 pounds; KCNO (potassium cyanate) 16 pounds; and the mixtures KCNO 8 pounds with CIPC (isopropyl-N-(3chlorophenyl) carbamate) 4 pounds; endothal 2 pounds with CIPC 3 pounds; and CMU 2 pounds with CIPC 5 pounds. The concentrations of the chemicals are expressed in pounds per acre of acid equivalent or active ingredient of the compound. They were all applied in 40 gallons of solution per acre and at a pressure of 30 pounds. Stand and weed counts were taken on July 25. Pigweed (Amaranthus retroflexus) was the predominant weed. CMU at 2 and 3 pounds, and the mixture of CMU with CIPC resulted in greater than 90% control of broadleaved weeds. CMU 1, endothal 3 and 5, and KCNO at 16 pounds gave between 80 and 90% control of broad-leaved weeds. The mixture of KCNO with CIPC gave 58% control, and that of endothal with CIPC gave 73% control. None of the treatments gave any measureable control of Crab grass (Digitaria Spp.). Stands of onions were significantly reduced (in the order of 25%) with CMU 3, endothal 3 and 5 pounds, and the mixture of CIPC with CMU and with Endothal. Because of the late planting the yields were not taken. (Department of Horticulture, University of Wisconsin, Agricultural Experiment Station, Madison, Wisconsin.)

Pre-emergence weed control in onions. Warren, G. F., Larsen, John, and Ellis, N. K. Two replicated experiments using Early Yellow Globe onions were conducted on muck soil. One row in each plot was seeded approximately 1½ inches deep on April 9, while the other was seeded 1/2 to 3/4 inch deep on April 21 without re-working the soil. Spraying was done April 22, between frequent showers which occurred throughout the day. The total rainfall on the 22nd and 23rd was .96 inches, but there was no more precipitation during the next two weeks. Treatments were applied in water at 50 gal/A except as otherwise indicated. At the time of spraying the early planting of onions was almost ready to emerge. Smartweed (Polygonum spp.), wild buckwheat (Polygonum convolvulus), and lamb's quarters (Chenopodium album) were mostly emerged when the spraying was done but only a few of the pigweed (Amaranthus retroflexus) and purslane (Portulaca oleracea) were up. The following treatments were applied: CIPC, 8 and 12 lb/A; 2,4-D amine, 1 lb.; endothal (with ammonium sulfate) 2 and 4 lb.; formulations of N-1 naphthyl phthalamic acid, 8 and 12 lb.; Stoddard Solvent, 75 gal; sodium isopropyl xanthate, 12 and 16 lb; CMU, 1 and 3 lb. Various combinations of all except the last herbicide were also used.

CIPC gave poor control of lamb's quarters and pigweed but excellent control of most other weeds present for a considerable period of time. Endothal controlled all weeds except lamb's quarters early in the season but did not have as lasting an effect as CIPC. 2,4-D gave good control of lamb's quarters and purslane, fair control of pigweed but little or no control of the other weeds. Stoddard solvent killed all weeds that were emerged when sprayed. N-1 naphthyl phthalamic acid controlled purslane but not much else. CMU and sodium isopropyl xanthate gave generally poor control of all weed species. Combination treatments supplemented each other and, therefore, often greatly improved over-all control. The average time in minutes required for the first two hand weedings (June 2 and 19) of 1/40A plots in one of the experiments was as follows: untreated, 624; Stoddard solvent 75 gal, 431; endothal, 4 lb. 218; 2,4-D, 1 lb combined 12 lb of N-1 naphthyl phthalamic acid, 165; CIPC, 12 lb combined with 1 lb of 2,4-D, 119; CIPC, 12 lb in 75 gal Stoddard solvent, 102. There was no significant difference in the time required for the third weeding on July 9 and 10. Onion stand counts were made May 24. Some of the treatments containing endothal reduced the stand of the early

planting about 25% but no other herbicide or combination of herbicides caused any significant reduction in number of onions in this planting. In the late planted rows, all treatments containing either endothal or 2,4-D reduced the number of onions by 25 to 65%. Yields taken on one of the experiments showed even greater reductions in the late planted rows due to these treatments. There was no apparent effect on growth or yield of those treatments that did not affect the stand. Considering both weed control and lack of injury to the onions, CIPC at 12 lb/A in 75 gal of Stoddard solvent was the outstanding treatment. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Indiana.)

Pre-emergence and early post-emergence control of weeds in onions. Warren, G. F. and Larsen, John. In a replicated experiment on muck soil one row of Early Yellow Globe onions was planted in each plot on April 11 and the other row April 21, without re-working the land. On May 1, with clear weather and a temperature of 70°F, the following treatments were applied in water at 100 gal/A: KOCN, 10 and 20 lb/A; sodium monochloroacetate, 12 lb; sodium isopropyl xanthate, 12 lb; sulfuric acid, 2½%. There was no rain the week prior to spraying and only .15 inches during the following week. At time of treatment the onions in the early planting were in the "knee" or "crook" stage while those in the second planting were just ready to emerge. The following weed species, all in the cotyledon stage, were present when spraying was done: purslane (Portulaca oleracea), pigweed (Amaranthus retroflexus), carpetweed (Mollugo verticillata), and annual grasses. KOCN at the 20 lb rate, sodium isopropyl xanthate, and sulfuric acid all gave over 80% reductions in numbers of the three broad-leaved weed species and 90,70 and 60% reductions, respectively, in the number of annual grasses. Sodium monochloroacetate and 10 lb of KOCN gave unsatisfactory control of one or more of the weed species. The stand of the early planted onions was reduced by 28 and 36% by KOCN at 20 lb/A and sodium isopropyl xanthate, respectively. The other treatments did not reduce the stand in the early rows and none of the treatments had any effect on the stand of the late planted onions. Considering both weed control and effect on the onions, only sulfuric acid was satisfactory as a selective spray on the onions that were in the "knee" stage when treated. KOCN at the 20 lb rate, sodium isopropyl xanthate and sulfuric acid were all satisfactory as contact pre-emergence sprays. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Indiana.)

Tolerance of onions to residual herbicides applied as post-emergence sprays. Warren, G. F. and Larsen, John. Early Yellow Globe onions in the 2 to 3 leaf stage growing on muck soil were hand weeded just before the following treatments were applied June 5: CIPC, 8 and 12 lb/A; SES, 2, 4 and 8 lb; N-1 naphthyl phthalamic acid, 12 lb; N-1 naphthyl phthalimide, 12 lb. Treatments were replicated and were applied as complete coverage sprays in water at 50 gal/A. The temperature was 88°F and there was no rain in the two days either prior to or after spraying. However, total rainfall for the two-week period following treatment was 3.62 inches. Weed population was too variable to give accurate records but it was noted that most of the treatments gave considerable control of purslane and some of them reduced the population of certain other species. The yield of No. 1 onions was reduced more than 30% by all rates of application of SES and over 70% by N-1 naphthyl phthalamic acid and N-1 naphthyl phthalimide. CIPC did not significantly affect the yield at either rate of application. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Indiana.)

OTHER VEGETABLE CROPS

Summary

L. G. Holm

Beets: Pre-emergence applications of 6 lbs of Endothal gave effective control of broadleaved weeds and grasses on both silt loam and organic soils with no injury to the beets. Post-emergence applications controlled many weeds but caused severe injury to the beets.

Carrots: In pre-emergence experiments on organic soil, CMU gave excellent weed control with a slight reduction in yield at 1½ lbs per acre. Mixtures of TCA and PCP gave excellent weed control on this soil type with no injury to the crop. CMU caused severe injury when used as a post-emergence spray. The above chemicals reduced yields significantly on a silt loam soil.

Sweet Potatoes: Pre-emergence treatments using N-1 napthyl phthalamic acid up to 10 lbs per acre gave good weed control but resulted in considerable injury to the crop. N-1 naphthyl phthalimide had no harmful effect on the sweet potatoes but was less effective in controlling weeds. Mixtures of the chemicals severely reduced stands. CIPC at 2 lbs per acre controlled 75% of the weeds for 3 weeks and gave no injury to the crop.

Tomatoes: For control of weeds in direct-seeded tomatoes, pre-emergence sprays of TCA and Stoddard solvent appear to show considerable promise. Little or no injury to the crop was reported. Increased effectiveness in the control of broadleaved weeds was obtained through the addition of PCP and sodium isopropyl xanthate.

Vine Crops: Pre-emergence sprays of N-1 napthyl phthalamic acid, N-1 napthyl phthalimide, and mixtures of these two chemicals gave good control of crabgrass and carpetweed without injury to muskmelons. The acid formulation alone gave fair control of foxtail and pigweed without injury to cucumber, squash, or watermelon. CMU gave injury to vine crops.

Abstracts of Results of Cooperators

Pre-emergence studies with CMU and eleven vegetable crops. Alban, E. K. During the 1951 and 1952 seasons, pre-emergence sprays of 0.5, 1.0, and 2.0 lbs of CMU/acre were applied at 0, 1, 3, 5, or 7 days over direct-seeded vegetable crops grown on muck soil and on a Brookston silt loam. Lettuce, tomato, beet, spinach, turnip, radish, carrot, sweet corn, lima bean, snap bean, and potato were included in these studies. Supplemental irrigation was used to maintain adequate moisture and to prevent crusting of the silt loam soil. Based on five duplicated studies on the silt loam and three duplicated studies on the muck soil, the following results were obtained. Lettuce, tomato, turnip, and snap beans were killed or severely damaged at all rates used. Lima beans, carrots, and radishes were killed or damaged at the two higher rates but did eventually grow out of the dwarfing effect of the 0.5 rate. Sweet corn revealed some slight dwarfing and chlorosis of lower leaves at the 2.0 lb. rate but only mild dwarfing at the 1.0 lb. rate and no damage with the lowest rate. Potatoes, beets, and spinach were only mildly affected at the 2.0 lb. rate (reduction in stand of beet and spinach) but revealed a fairly high tolerance to the two lower rates of CMU. Weed control during the six to ten weeks that these studies were maintained, indicated that CMU was the most effective pre-emergence herbicide that we have used during the past seven years, relative to

residual value and general effectiveness with a wide range of weed species. With the 2.0 lb. rate, no weeds developed during the period of study. At the 1.0 lb. rate, foxtail Setaria spp. and purslane Portulaca oleracea began to come back in as scattered plants in the treated area after six to seven weeks. At the 0.5 lb. rate, the species mentioned above plus crabgrass Digitaria spp., galinsoga Galinsoga parviflora, and pigweed Amaranthus retroflexus started to develop after four to five weeks. (Ohio Agricultural Experiment Station.)

Pre-emergence studies with CIPC and twelve vegetable crops. Alban, E. K. During the 1951 and 1952 seasons, pre-emergence sprays of 1.0, 3.0, 4.0, 5.0, and 6.0 lbs. of CIPC/acre were applied at 0, 1, 3, 5, 7, or 14 days over direct-seeded vegetable crops grown on muck soil and on Brookston and Miami silt loams. Lettuce, tomato, beet, spinach, turnip, radish, carrot, onion, lima bean, snap bean, sweet corn, and potato were included in these studies. Supplemental irrigation was used to maintain adequate moisture and to prevent crusting of the silt loam. Based on five duplicated studies on the silt loams and three duplicated studies on the muck soil, the following results were obtained. With the exception of lettuce and tomato, all of the other vegetable crops revealed a reasonable tolerance to the 1.0 and 3.0 lb. rates of CIPC, particularly with the delayed pre-emergence application. Beet, spinach, radish, sweet corn, lima bean, snap bean and potato were fairly tolerant of the 4.0 lb. rate, but there was a tendency toward dwarfing of radish and potato. At the two higher rates of CIPC, only beets, spinach, lima and snap beans and potatoes had a satisfactory stand and potatoes in these plots were only half the size of potatoes in untreated plots. This dwarfing effect largely disappeared within six weeks. Pre-emergence sprays applied just prior to emergence of the crop were far superior to sprays applied at time of planting or one or two days later. Weed control at the 1.0 lb. rate was very poor. At the 3.0 lb. rate, weed control was somewhat variable; occasionally annual grasses and broadleaf weeds were controlled two to four weeks, but in other instances weed control was very poor. At the three higher rates, however, weed control could generally be considered very adequate, four to six weeks. CIPC was very effective in controlling Setaria spp., Digitaria spp., and Portulaca oleracea. Reasonably good control of Amaranthus spp., Galinsoga parviflora, Polygonum spp., Ambrosia artemisifolia, Abutilon abutilon, and Stellaria media was obtained at the higher rates. Lambsquarters Chenopodium album was not controlled with any of the concentrations of CIPC used. (Ohio Agricultural Experiment Station.)

Pre-emergence studies with sodium isopropyl xanthate and twelve vegetable crops. Alban, E. K. During the 1950, 1951, and 1952 seasons, 8.0, 12.0, 16.0, 20.0, and 24.0 lbs. of sodium isopropyl xanthate per acre were applied over direct-seeded vegetable crops grown on muck soil and Miami and Brookston silt loams. All sprays were applied at the rate of 80 gal. per acre just prior to the emergence of lettuce, tomato, spinach, beet, turnip, radish, carrot, onion, lima bean, snap bean, sweet corn, and potato. Supplemental irrigation was used to maintain adequate moisture and prevent crusting of the silt loam. Based on five duplicated studies and one study with four replications on the silt loam and three duplicated studies on muck soil, the following results were obtained. Satisfactory stands, with no crop injury, were obtained with all rates of sodium isopropyl xanthate on tomato, beet, radish, carrot, lima bean, snap bean, sweet corn, and potato. Results with lettuce, spinach, turnip, and onion were too erratic, but appeared to involve time of application as the major factor. Adequate control of most annual broadleaf weeds was obtained at all concentrations, although the results were much better above 12.0 lbs. Annual grasses were not controlled with even the highest rate. Addition of a wetting agent to the 16.0 to 24.0 lb. rates did increase the effectiveness of grass control, particularly with crabgrass Digitaria spp. Foxtail, Setaria spp. was

much more difficult to control. Sodium isopropyl xanthate is primarily a contact herbicide (with or without wetting agent) and residual effects were negligible. (Ohio Agricultural Experiment Station.)

Pre-emergence studies with octachlorocyclohexenone and ten vegetable crops. Alban, E. K. During the 1951 and 1952 seasons, pre-emergence sprays of 0.5 and 1.0 gal. of octachlorocyclohexenone plus 29.5 and 29.0 gal. of diesel fuel per acre were applied over direct-seeded vegetable crops grown on Miami and Brookston silt loam. Sprays were applied just prior to emergence of lettuce, tomato, beet, spinach, radish, carrot, onion, lima bean, snap bean, and sweet corn. Supplemental irrigation was used to maintain adequate moisture and to prevent crusting. Based on four separate duplicated studies and one study with four replications, the following results were obtained. Satisfactory stands with no crop injury were obtained with tomato, beet, radish, lima bean, snap bean, and sweet corn. Lettuce, spinach, carrot, and onion stands were practically always reduced with this treatment. With carrots it was noted that when the spray was applied three or four days before emergence, the stand was not materially reduced. There was very little difference noted between the effectiveness of the 0.5 and 1.0 gal. of active ingredient in the oil spray. Weed control with this chemical was comparable to that ordinarily obtained with Stoddard Solvent. Annual grasses and broadleaf weeds were controlled for about two to three weeks, although this control did not involve residual effects of the chemical but rather control of the first flush of weeds. Setaria spp., Digitaria spp., Galinsoga parviflora, Amaranthus spp., Portulaca oleracea, Polygonum spp. and Chenopodium album were the major weeds included in the study. (Ohio Agricultural Experiment Station.)

Importance of supplemental irrigation in increasing the effectiveness of pre-emergence applications of herbicides in vegetable crop plantings. Alban, E. K. During the past six years, direct-seeded vegetable crop plantings have been made on Miami and Brookston silt loam and on muck soils. In some instances, supplemental irrigation was used to prevent crusting, to firm the soil, and to aid in the development of an even flush of weed seedlings prior to the application of herbicides. In other instances, no attempt was made to alter the prevailing soil moisture or surface structure after sowing the seed. The effectiveness of all herbicides used in delayed pre-emergence was increased, both in relation to minimum chemical required and maximum weed control value, when moisture content of surface soil was adequate and where a firm surface was obtained. In non-irrigated plots, the results were very erratic, not only in regard to weed control but also with crop injury. Contact, contact-residual, and systemic herbicides were all most effective under the controlled soil surface conditions obtained with frequent light applications of water. Stoddard Solvent, KOCN, sodium isopropyl xanthate, and octachlorocyclohexenone were of very little value when applied to large granulated and dry surface soil. The sodium salt of PCP; oil formulations of PCP, DNOSBP and various amine or salt formulations; IPC; CIPC; sodium or calcium salt of TCA; MCP; 2,4-D or amine, ester, or salt formulations; and SES; applied as a delayed pre-emergence treatment, always produced variable results relative to weed control or crop injury where the soil surface was less than ideal as described above. During the latter part of May through June, July, August, and early September under Ohio conditions, the major factors influencing the effectiveness of delayed pre-emergence herbicides appeared to involve surface moisture and granulation. (Ohio Agricultural Experiment Station.)

Value of supplemental irrigation in minimizing 2, 4-D or 2,4,5-T vapor or drift damage with tomatoes, cucumber and muskmelon. Alban, E. K. In studies conducted in Central Ohio, as well as through observations throughout Ohio, one of

the major factors determining the effect of drift or vapor damage of 2,4-D and 2,4,5-T appeared to involve an adequate amount of moisture in the soil following exposure of the susceptible plants to these chemicals. Drift or vapor damage from these chemicals, equivalent to a one to one-hundred ppm spray, was negligible if water was applied at the rate of 0.5 to 1.5 inches per acre within twenty-four hours after the first symptoms were noted. Tomato, cucumber, and muskmelon plants sprayed with higher concentrations of 2,4-D or 2,4,5-T were always seriously damaged unless the spray was washed off the leaves within an hour of spraying. Sprays containing over 100 ppm of 2,4,5-T usually resulted in a severe loss of tomato blossoms and in a few instances, small fruits up to a quarter of an inch were lost. The larger fruits did not appear to be damaged with this concentration of 2,4,5-T. Concentrations above 50 ppm of 2,4-D generally resulted in malformation of most of the tomato fruit and rather severe foliage damage. Where concentrations above 200 ppm of either chemical were used, and the plants were not irrigated immediately, the damage to muskmelon, cucumber, and tomato was severe enough to indicate the loss of the crop. Typical 2,4-D and 2,4,5-T damage to foliage of these crops could be obtained with sprays containing 5 ppm of either chemical. (Ohio Agricultural Experiment Station.)

Pre-emergence studies with PCP and twelve vegetable crops. Alban, E. K. During the past four years 5.0, 8.0, 10.0, 12.0, 16.0, and 20.0 lbs. of PCP per acre have been applied over direct-seeded vegetable crops grown on muck soil and Miami and Brookston silt loams. All sprays were applied at the rate of 50 gal. per acre from time of seeding to just prior to emergence of lettuce, tomato, spinach, beet, turnip, radish, carrot, onion, lima bean, snap bean, sweet corn, and potato. Supplemental irrigation was used in most instances to maintain adequate moisture and to prevent crusting of the silt loams. Based on five duplicated studies and two studies with four replications on the silt loams and four duplicated studies on muck, the following results were obtained. Tomato, beet, spinach, radish, lima bean, snap bean, sweet corn, and potatoes were successfully treated with delayed pre-emergence applications of 5.0 to 12.0 lbs. of PCP/acre. Sweet corn, lima beans, snap beans, and potatoes were not damaged at even the highest rates of PCP. Where PCP was successfully used with the small seeded crops Dow H 916 was superior to Shell 130. On the larger seeded crops, there was no difference between the two formulations of PCP. Onions were successfully weeded on the muck soils with 8.0 and 12.0 lb. of PCP (Dow H 916) but not on silt loam soils. Control of annual grasses and broadleaf weeds was accomplished with rates as low as 8.0 lbs. PCP, although 10.0 to 12.0 lbs. appeared to be lowest rates which provided consistent results. Excellent control of foxtail Setaria spp. crabgrass Digitaria spp. purslane Portulaca oleracea, pigweed Amaranthus spp. galinsoga Galinsoga parviflora, lambsquarters, Chenopodium album, and buttonweed Abutilon abutilon. (Ohio Agricultural Experiment Station)

Results of a screening test with newer herbicides on vegetables. Freeman, J. A. During the 1952 season a screening test was conducted to determine the value of CMU, N-1 (N-1 naphthyl phthalamic acid), and DNOSBP, alkanolamine salts, (Premerge) and pre-emergence and post-emergence herbicides on 14 different vegetables i.e. beans, beets, broccoli, cabbage, carrots, corn, cucumbers, lettuce (butterhead and crisphead), onions, parsnips, peas, radish, spinach, and turnips. CMU at .04 to .08 lb/A showed promise as a pre- and post-emergence weedicide for all vegetables tested except brassicas and cucurbits. Rates of 1.6 to 2.4 lb/A gave 100% weed control but also caused a reduction in stand of all vegetables. N-1 at 2 to 10/lb/A caused dwarfing and epinastic effects to all vegetables except cucumbers. Parsnips appeared most sensitive. Beans having both pre- and post-emergence treatments flowered 4-5 weeks later than those having only the pre-emergence treatment. The 5 to 10 lb/A rate gave fair to good weed control. DNOSBP

at 1.5 to 6 lb/A phenol equivalent caused a reduction in stand of all vegetables except beans, peas, and corn. Depth of seeding appeared to affect the percentage stand, indicating this chemical may be useful for small-seeded vegetables if depth of seeding is increased. The 3 lb/A rate gave very satisfactory weed control, in fact, this rate gave as good control as 4.5 to 6 lb/A. (Contribution from the Dominion Experimental Farm, Agassiz, B. C.)

A comparison of soil drenches and fumigation treatments for controlling weeds in seed beds. Freeman, J. F. and Hansen, J. R. Drenches of allyl alcohol at rate of 6 qt in 200 gal water; CBP Emulsible (Shell Oil Company) at 4, 8, and 16 qt in 100 gal water and 8 qt in 200 gal water/100 sq yd bed; and methyl bromide soil fumigant, 9 lb/100 sq yd for 24 hour exposure period were used on thoroughly prepared Maury silt loam soil, April 8, 1952. Soil temperature at 3 in. depth was 65°F. at time of treatment. The drenches penetrated the soil 3 in. deep where 200 gal of water were used and 1.5 in. with 100 gal. Treatments were duplicated. A period of dry weather followed treatment. Weed counts were made May 3 and again on June 17. At first count all treatments had been effective in preventing weeds, but untreated plots were heavily infested. At second count, allyl alcohol, 6 qt in 200 gal water, and methyl bromide were equally effective in weed control. CBP at 8 qt in 200 gal water was almost as effective as the treatments just mentioned but fully as effective as the 16 qt rate of CPB in 100 gal water and considerably more effective than the 8 and 4 qt. rates in 100 gal water. (Kentucky Agricultural Experiment Station.)

Pre-emergence weed control in cucurbits. Hemphill, D. D. DNOSBP, amine salt (Premerge) 4 pounds per acre; N-1 Naphthyl phthalamic acid, 4 pounds per acre; and CMU, 1 pound per acre were applied to cantaloupes, Hale's Best and Irocuois varieties, cucumbers, Chicago Pickling variety, squash, U-Conn variety, and watermelons, N. H. Midget and Garrison varieties three days after planting. Weed counts made approximately one month after treatment indicated only approximately 50% weed control in Premerge and N-1 Naphthyl phthalamic acid plots, however weeds were suppressed long enough for the crop plants to make considerable growth and weed competition was not severe. Primary weed pests were crabgrass (Digitaria sanguinalis) foxtails (Setaria spp.) and pigweeds (Amaranthus spp.). No visible injury could be observed in Premerge or N-1 Naphthyl phthalamic acid plots, however CMU reduced plant stand approximately 75 per cent in cantaloupes, cucumbers and watermelons and approximately 25 per cent in squash. Yields of Premerge and N-1 Naphthyl phthalamic acid plots were comparable to or higher than that of control plots. (Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri. Journal Series 1331.)

Selective chemical weed control in sweet potatoes. Hemphill, D. D. SES, 4 pounds per acre, and N-1 Naphthyl phthalimide, 5 pounds per acre, were applied to sweet potatoes, Gold Rush variety, three days after setting. SES gave very satisfactory weed control (75 per cent) but some injury was indicated by a higher mortality of plants in SES plots than in Control or N-1 Naphthyl phthalimide plots. N-1 Naphthyl phthalimide did not give as satisfactory weed control as SES but there was no evidence of injury from this material. Both N-1 Naphthyl phthalimide and SES plots gave higher yields than control plots with N-1 Naphthyl phthalimide plots the highest. (Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri. Journal Series 1332.)

Pre-emergence sprays for chemical weed control in carrots. Holm, L. G. Red-cored Chanteray carrots were planted in an organic soil in early June in a four replication randomized test and pre-emergence treatments were made 5 days after

planting. Rainfall was 2.8 inches in the 2 weeks after planting. Pigweed (Amaranthus retroflexus), smartweed (Polygonum hydropiper), barnyard grass (Echinochloa crus-gali), crab-grass (Digitaria species), and water hemp, (Acnida tuberculata) were the predominant weeds in the area. Stand counts of both carrots and weeds were made 1 month after planting and the plots were maintained free from weeds thereafter. The following chemicals were applied (all concentrations are in pounds per acre of acid equivalent or active ingredient of the appropriate compound): 3-CIPC (isopropyl-N-(3-chlorophenyl) carbamate) 4 and 6; CMU (3-p-chlorophenyl-1-1-dimethylurea) 1½, 2, and 2½, TCA (sodium salt) 10 mixed with 2 and 4 of PCP (sodium salt); and TCA 12 mixed with 2 and 4 of PCP. All treatments reduced the weed stands significantly. The CMU treatments reduced the weed stands 90 - 95%, the TCA-PCP mixtures 75 - 85% and the 3-CIPC about 45%. Only CMU at 2 and 2½ reduced the stands of carrots seriously. CMU at 2 and 2½ reduced the yield significantly; at 1½ the reduction was not significant but amounted to about 15%. 3-CIPC at 4 and 6 reduced yields by 4 and 10% respectively while the TCA-PCP mixtures all provided yields which were equal to or better than those of the control plots. CMU applied at the rate of 2 and 3 lbs as a post-emergence spray approximately 4 weeks after planting gave marked reduction in yields. A similar experiment was carried out on silt loam soil where CMU and the TCA-PCP mixtures provided excellent weed control but reduced the stands and yields of the crop seriously. 3-CIPC was ineffective for weed control on upland soils. It appears that CMU and the TCA-PCP mixtures merit further work with a view toward reducing the present high cost of chemical weed control with oil in carrots. (Department of Horticulture, University of Wisconsin, Agricultural Experiment Station, Madison, Wisconsin.)

Pre-emergence weed control in snap beans. Lana, E. P. 2,4-D ester 1 lb/A, 2,4-D amine 1 lb/A, Chloro IPC 4 lb/A, DNOSBP 6 lb/A, and N-1 naphthyl phthalamic acid 4 lb/A were applied within 24 hours after planting. SES sodium salt was applied at 2 lb/A at general emergence of the beans. Plots receiving DNOSBP and IPC showed a significant increase in yields. DNOSBP, IPC and 2,4-D ester exhibited typical 2,4-D reaction on the first 2 pair of true leaves, but the remainder of the plant growth did not show this reaction. Yields were as good as the control. SES applied at emergence gave very poor weed control and yields were reduced. (Iowa Agricultural Experiment Station, Ames, Iowa.)

Pre-emergence weed control in direct-seeded tomatoes. Lana, E. P. Stanisol 60 gal., 2,4-D amine 1 lb., CMU 1 and 2 lbs. TCA sodium salt 4 and 8 lbs., Chloro IPC 4 and 8 lbs., endothal 4 and 8 lbs., N-1 naphthyl phthalamic acid and N-1 naphthyl phthalimide 4 and 8 lbs. were the materials used and concentrations per acre. Plant stand was least affected by Stanisol, TCA 4 and 8 lbs. and NPA imide 4 pounds. CMU at both rates killed all tomato plants. Satisfactory weed control was obtained with Stanisol, TCA 4 and 8 lbs., 2,4-D amine and endothal, CMU at 1 and 2 lbs/A controlled 90% of the weeds. NPA acid and imide at both rates and IPC gave unsatisfactory weed control under cool spring conditions. 2,4-D anime and endothal caused tomato plant injury. 2,4-D showed the typical crinkled strap leaf formation. Endothal treated plants were chlorotic with severe stunting. IPC gave a similar reaction to endothal, NPA acid and imide gave a reaction similar to 2,4-D without stunting. TCA and Stanisol appear most satisfactory from the weed control and tomato plant survival aspects. (Iowa Agricultural Experiment Station, Ames, Iowa).

The control of weeds in red beets with Endothal. Tibbitts, T. W. and Holm, L. G. The use of herbicides in table beets has increased greatly with the discovery that TCA may be used effectively for the control of annual grasses. However,

much of the beet acreage, especially on organic soils, is often seriously infested with several species of broadleaved weeds. This report includes two years of experimentation with Endothal on both organic and silt loam soils with a view toward the selective control of both types of weeds. The major weeds on the silt loam soil were lambsquarters (Chenopodium album), redroot pigweed (Amaranthus retroflexus), shepherd's purse (Capsella Bursa-pastoris), German millet (hand planted) and foxtail (Setaria sp.). The weeds on the organic soil were lady's thumb (Polygonum Persicaria), redroot pigweed and water hemp (Acnida tuberculata). All experiments were planted between May 15 and June 1. The following table is a summation of the results in 1951 and 1952 at two rates of Endothal (expressed as the lbs. per acre of active ingredient). The chemicals were applied as pre-emergence sprays in four replication randomized block design experiments.

	Endothal-4 lbs.		Endothal-8 lbs.	
	Marsh	Silt Loam	Marsh	Silt Loam
Stand of Beets *	125	106	112	105
Yield of Beets *	102	104	110	106
Broadleaved weeds controlled *	61	82	77	95
Grasses Controlled *		96		97

*Expressed as percent of the control plots

The control of weeds was very good on the silt loam soil but the chemical was somewhat less effective on the organic soil. This is in agreement with many reports which have indicated that soils high in organic matter tend to reduce the toxicity of herbicidal compounds. In general, the chemical gave excellent control of the grasses listed above and was particularly effective against smartweed, water hemp, pigweed, and shepherd's purse. Endothal did not reduce the stand of beets and did not suppress the yield when compared to control plots, which were maintained free from weed competition throughout the growing season. The 8 pound treatments on the silt loam soil stunted the beets temporarily. The plants recovered rapidly from this injury and showed no reduction in yield at harvest time.

Post-emergence treatments were studied with the use of duplicate experiments in such a way that one set of plots could be clean weeded to obtain a true measure of the chemical injury to the beets. Applications were made upon both soil types at ten and twenty-one days after emergence of the beets. Successful control of smartweeds and pigweeds was obtained only at the earliest date. The sprays caused considerable contact burning and death of some of the beets and produced significant reductions in the yield. For this reason the pre-emergence treatments seem to be more advisable unless conditions force the use of post-emergence treatments.

The data in the table above indicates almost complete control of grassy weeds by Endothal in our experiments, however observations in commercial field trials show that often some annual grasses escape injury. This is in contrast to the very consistent control of grasses provided by TCA under commercial conditions. Endothal has some measure of residual activity for weed control has often been obtained for a period of several weeks with a single application. (Department of Horticulture, University of Wisconsin, Agricultural Experiment Station, Madison, Wisconsin.)

Weed control in muskmelons. Warren, G. F. Queen of Colorado muskmelons transplanted May 13 into a fine sand soil were given the following treatments on May 14: N-1 naphthyl phthalamic acid, 2 and 4 lb/A; N-1 naphthyl phthalimide, 2, 4 and 8 lb; N-1 naphthyl phthalamic acid, 2 lb combined with 2 and 4 lb of N-1 naphthyl phthalimide. The treatments were replicated 5 times and all materials were applied in water at the rate of 50 gal/A. The first rain came 4 days after spraying and the total for the first 2 weeks was 1.28 inches. Counts of crabgrass (Digitaria sanguinalis) and carpetweed (Mollugo verticillata) were made May 28, and June 18, and all plots were clean cultivated and hoed immediately after each weed count was made. All treatments of N-1 naphthyl phthalamic acid, either alone or in combination, reduced the number of crabgrass and carpetweed plants at both dates by 70% or more and severely stunted those not killed. N-1 naphthyl phthalimide alone, at all rates, gave only 35 to 60% reductions in these two weed species on May 28 but control at the time of the second count was comparable to that with the "acid" formulation. There was no significant effect of any treatment on the yield or maturity of the muskmelons and flavor tests indicated no difference between melons from treated and untreated plots. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Indiana.)

Weed control in sweet potatoes. Warren, G. F. Yellow Jersey sweet potatoes transplanted May 5, into a fine sand soil were given the following treatments on May 6: CIPC, 2 lb/A; N-1 naphthyl phthalamic acid, 2 and 4 lb; N-1 naphthyl phthalimide, 2, 4 and 8 lb; N-1 naphthyl phthalamic acid, 2 lb combined with 2 lb of N-1 naphthalimide; N-1 naphthyl phthalamic acid, 1 lb combined with 3 lb of N-1 naphthalimide. The treatments were replicated 6 times and all materials were applied in water at the rate of 50 gal/A. The soil was dry when treatments were applied but starting on May 8, there were frequent showers totaling 1.87 inches in 2 weeks. Counts of crabgrass (Digitaria sanguinalis) and carpetweed (Mollugo verticillata) were made May 28 and June 18 and all plots were clean cultivated and hoed immediately after each weed count was made. All treatments reduced the number of crabgrass and carpetweed plants present on May 28, by over 75% and severely stunted those not killed. There was excellent control of carpetweed and considerable control of crabgrass on June 18, by all treatments except CIPC, which gave only a 50% reduction in carpetweed numbers and no control of crabgrass. In general, weed control at both dates increased with rate of application and was somewhat better with N-1 naphthyl phthalamic acid than with N-1 naphthyl phthalimide. All sprays containing N-1 naphthyl phthalamic acid severely stunted the sweet potatoes and reduced the yield by 50% or more. None of the treatments with N-1 naphthyl phthalimide or with CIPC caused any visible injury nor reduction in yield. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Indiana.)

Pre-emergence weed control in direct-seeded tomatoes. Warren, G. F. Rutgers tomato seed was planted 3/4-inch deep in a silt loam soil on May 2. A small percentage of the tomatoes had emerged when the following sprays were applied on May 19: TCA sodium salt, 3 lb acid equivalent per A both with and without a wetting agent; sodium isopropyl xanthate, 12 lb combined with 3 lb of TCA, both with and without a wetting agent; PCP (9.4% in oil), 2 lb combined with 3 lb TCA, with a wetting agent; Stoddard solvent, 50 gal. The treatments were replicated 6 times and all materials except Stoddard solvent were applied in water at the rate of 50 gal/A. At time of spraying, the soil was wet, temperature was 55°F and a light drizzle was falling. Rainfall during the two weeks following treatment totaled 3.48 inches occuring as almost daily showers. Weed and tomato stand counts were made 2 to 3 weeks after spraying. A considerable proportion of the velvet leaf (Abutilon Theophrasti), and about one-fourth of the annual grasses (mostly Setaria

lutescens) but very few of the pigweed (Amaranthus retroflexus) present in the experiment had emerged at time of treatment. All treatments except Stoddard solvent reduced the number of grasses by over 93%. Stoddard solvent gave only a 20% reduction. The combination treatments reduced the numbers of velvet leaf and pigweed by over 75% but TCA alone gave poor control of these weeds. Stoddard solvent reduced the number of velvet leaf plants by 70% but gave no control of pigweed. In the two comparisons made, the addition of a wetting agent had little or no effect on the results obtained. None of the treatments caused any significant reduction in the stand of tomatoes and there were no visible symptoms of injury. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Indiana.)

FRUITS AND ORNAMENTALS

Summary

D. D. Hemphill

Cherries. A report of two year's work with herbicides in young Montmorency cherry plantings indicates that Endothal, CIPC and CMU and mixtures of these materials hold promise for use in such orchards.

Raspberries. One report indicates that SES is an effective herbicide for use in Latham raspberries. At rates as high as 6 pounds per acre, no deleterious effect was noted on yield or sucker plant development.

Strawberries. Data from two reports indicate that 2,4-D (amine or ester) used as foliage applications at rates of 1 pound per acre may reduce runner production somewhat but not enough to reduce yields significantly. Higher rates reduce both runner production and yields markedly. Foliage applications of SES at 4 pounds per acre may reduce runners significantly but there is no corresponding reduction in yield. Effective weed control is usually obtained at this rate of application. Significant yield increases were obtained by the use of SES at rates of 4 and 6 pounds per acre in everbearing strawberries growing under the three-row hill system and mulched with chopped corncobs.

Dichloral urea does not appear as effective in weed control as SES and causes as much or more reduction in runner production and yields. Ethyl xanthogen disulfide used as pre-planting and foliage applications was ineffective in weed control and cause severe injury to the strawberry plants.

Gladiolus. DNOSBP (amine salt) used as pre-emergence and basal directed post-emergence treatments was the most promising herbicide for weed control in gladiolus cormels grown for size increase. The use of CMU, SES and N-1 naphthyl phthalamic acid for pre- and post-emergence treatments deserves further study. TCA, CIPC and 2,4-D (amine salt) gave marked reductions in yield.

Nursery Stock. Three reports were received of herbicidal work in nursery plantings. SES, N-1 naphthyl phthalamic acid and N-1 naphthyl phthalimide were used in established plantings containing Juniperus procumbens, Juniperus chinensis Juniperus chinensis Maney, Picea glanca densata, Picea pungens, Syringea spp., Philadelphus spp., and Paeonia spp. SES at the 6 pound rate reduced hand labor by two-thirds. In weed control 5 pounds of N-1 naphthyl phthalamic acid or N-1 naphthyl phthalimide is about comparable to 3 pounds of SES. No apparent injury was sustained by any of the plant materials. In another experiment in Thuja orientalis transplant beds SES and N-1 naphthyl phthalamic acid gave effective weed control without apparent plant injury. In the third study chopped corncobs soaked in a water solution of SES were used as a mulch for Cornus stolonifera and Ligustrum amurense. Effective weed control without apparent plant injury resulted.

Abstracts of Results of Cooperators

Weed control in raspberries with SES. Denisen, E. L. SES has been used in two successive seasons in the same planting of Latham raspberries at 2, 4 and 6 lb/A on a heavy loam soil. The applications were made twice during each season following thorough cultivation. Very effective control of annual grasses and broadleafed weeds was obtained and no deleterious effect was noted either on the raspberry plants or on the rate and extent of sucker plant development. Yield records taken during the summer of 1952 showed no significant effect of the herbicide. One month after the second application of SES oats were planted as a cover

crop and there were no observable effects of any of the treatments on the germination of the cover crop. (Department of Horticulture, Iowa State College, Ames, Iowa).

Chemical weed control in strawberries. Denisen, E. L. Results of three years tests with SES in strawberry weed control have been completed. With the Dunlap variety no significant reductions in yields were obtained when SES was applied at rates of 2, 4 and 8 lb/A in a new planting even though there were significant reductions in runner set for the 4 and 8 lb. treatments. When these same rates were applied the second year on the same plots following renovation, all plots formed a full matted row and showed no significant yield reductions for any treatment the following spring (1952). With the Robinson variety SES at 4 and 6 lb/A gave effective control of annual grasses and broadleafed weeds and 2,4-D isopropyl ester at 1 lb. acid equiv/A gave good control of broadleafed weeds. There were no significant differences in yield for any of the treatments the following spring (1952). During the 1951 season SES was applied to four varieties of everbearing strawberries planted according to the three-row hill system in which all plots were mulched with chopped corncobs and all runners were removed. The treated plots were sprayed twice during the season at 4 lb/A for the first application before mulching and at 6 lb/A four weeks later over the mulch. Very effective weed control was obtained and highly significant increases in yield resulted for each variety in the treated plots. The spring yields in 1952 also showed significant increases for the herbicide treated plots. In each of the above experiments spring applications of E.H.1 were made in 1952 before blossoming. With the exception of the mulched plots, the effectiveness of SES was not as great as in previous experiments in which the herbicide was applied during the summer when soil temperatures were higher. All applications of SES were preceded by thorough weeding. (Department of Horticulture, Iowa State College, Ames, Iowa).

Weed control in sour cherry orchards. Gilbert, F. A. and Holm, L. G. In 1951 it was discovered that rather high rates (15 to 20 lbs.) of 3-CIPC (isopropyl-N-(3-chlorophenyl) carbamate) and Endothal (3, 6-endoxohexahydrophthalate) gave excellent control of broadleaved and grass weeds in a sandy loam soil without injury to the newly planted Montmorency cherry trees. There was also some indication that the young trees would tolerate low rates of CMU (3-p-chlorophenyl-1-1-dimethylurea). This work has been continued and expanded by use of mixtures of the above chemicals and through the use of more than one treatment per season. A 4-foot strip on either side of the trees was sprayed in such a manner that the bases of the trees were always hit from two directions. All chemicals (herein expressed as pounds per acre of active ingredient) were applied to freshly cultivated soil at 30 lbs. pressure in 40 gallons of water per acre. The weed population of the area consisted of about equal proportions of the following weeds: Foxtail (Setaria species), lambsquarters (Chenopodium album), pigweed (Amaranthers retroflexus), quack grass (Agropyron repers) and barnyard grass (Echinochloa crus-gali).

In 1951, 3-CIPC, 20 lbs and Endothal, 15 lbs provided 80% weed control until late August without injury to trees. These young trees put on twice as much new growth when compared with trees growing in the unweeded control plots. These same chemicals, applied again in 1952 to the same trees, gave good weed control and were without effect on the trees. CMU at 10 and 20 lbs allowed no weed growth but caused injury to the trees by late summer.

In 1952, in a new planting, the sprays were applied in late May about 3 weeks after the trees were planted (early spray) and some of the same plots were again treated in late July (late spray). Where Endothal and 3-CIPC at 15 lbs were applied

to trees both early and late, the weed stands were reduced by 85 - 90% for most of the season. Twenty pounds applied early and 10 pounds applied late gave complete control of all weeds. CMU at 2½ lbs, applied early and late, gave 80% weed control. CMU at 2 lbs mixed with 3-CIPC or Endothal 10 lbs (applied early) gave equally good control of weeds for the season. CMU, 5 lbs, applied early and late, gave 100% weed control but caused some injury to the trees late in the season. CMU, 3-CIPC and Endothal appear to hold real promise for weed control in orchards and to merit further investigation for use in young nursery stocks. (Department of Horticulture, University of Wisconsin, Agricultural Experiment Station, Madison, Wisconsin.)

Effects of certain herbicides on runner production and yields of strawberries 1951-52. Hemphill, D. D. SES, Dichloral urea, Ethyl xanthogen disulfide (Sulfasan) and 2,4-D (amine) were used at several rates as herbicides in a new Blakemore strawberry planting in 1951. Four applications of each chemical were used. SES, Dichloral urea and Sulfasan were applied one week after setting, June 8, July 28 and August 17. 2,4-D was used at rates of 2 and 3 pounds acid a few hours before setting and at rates of 1 and 1½ pounds on June 8, July 28 and August 17. For effectiveness in weed control see Research Report NC WCC 1951. Effects of treatments on runner and fruit production are as follows: Control - 114, 405 plants and 125 crates per acre; SES, 4 pounds per acre - 105,270 plants and 132 crates per acre; SES 6 pounds per acre - 78,735 plants and 121 crates per acre; SES, 8 pounds per acre - 66,555 plants and 67 crates per acre; Dichloral urea, 3 pounds per acre - 104,440 plants and 132 crates per acre; Dichloral urea, 4 pounds per acre - 100, 920 plants and 115 crates per acre; Dichloral urea, 6 pounds per acre - 68, 730 plants and 95 crates per acre; Sulfasan, 4 pounds per acre - 44, 370 plants and 65 crates per acre; Sulfasan, 8 pounds per acre - 43,065 plants and 67 crates per acre; 2,4-D (amine) 2 and 1 pounds per acre - 83,085 plants and 120 crates per acre; 2,4-D (amine), 3 and 1½ pounds per acre - 66,990 plants and 85 crates per acre. (Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri. Journal Series 1333.)

Weed control in gladiolus cormels. Hemphill, D. D., Mann, Jack and Smith, J. E. Jr. Several herbicides were used as pre- and post-emergence treatments for weed control in plantings of gladiolus cormels grown for size increase. DNOSBP, amine salt, was applied at rate of 6 pounds per acre on May 4 before emergence of the gladiola and at rate of 3 pounds per acre as a basal directed spray on July 30. TCA, sodium salt, was used pre-emergence at rate of 10 pounds per acre and as a directed basal spray at rate of 5 pounds per acre on July 30. CMU was used at rate of ½ pound per acre pre-emergence and as a foliage spray 1 pound per acre on July 30. CIPC was used at rate of 10 pounds per acre pre-emergence and at rate of 5 pounds as a foliage spray on July 30. SES was used at rate of 4 pounds per acre pre-emergence and at rate of 3 pounds for foliage applications June 29 and July 30. N-1 naphthyl phthalamic acid was used at rate of 5 pounds pre-emergence and 3 pounds for each of two foliage applications. 2,4-D amine salt, was used at rate of 2 pounds per acre pre-emergence and 1 pound for each of two foliage applications. Per cent control of weeds for various chemicals was: DNOSBP-56 broad-leaved, 53 narrow-leaved; TCA-51 broad-leaved, 38 narrow-leaved; CMU-82 broad-leaved, 47 narrow-leaved; CIPC-58 broad-leavef, 42 narrow-leaved; SES-58 broad-leaved, 54 narrow-leaved; N-1 naphthyl phthalamic acid 39 broad-leaved, 61 narrow-leaved; 2,4-D-59 broad-leaved, 66 narrow-leaved. Yields expressed in per cent of yield of control plots which were hand-weeded weekly are as follows: DNOSBP-216; TCA-66, CMU-80; CIPC-52; SES-77; N-1 naphthyl phthalamic acid-84; 2,4-D-38. (Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri. Journal Series 1334.)

Chemical weed control in established nursery stock II. Mahlstede, J. P. Eight replications (1200 square feet per replication) containing Juniperus procumbens (5th year), Juniperus chinensis Ames, (7th year), Juniperus chinensis Maney (7th year), Picea glauca densata (5th year), Picea pungens (5th year) Syringa spp., Philadelphus spp., and Paeonia spp. (3rd year) were sprayed with two herbicides in May and July of 1952, after the plots had been cultivated and cleared of weeds. SES at 3, 6 and 8 pounds per acre, N-1 naphthyl phthalamic acid (NPA), 5 pounds per acre, and N-1 naphthyl phthalimide (NPI), 5 pounds per acre were applied to weed-free plots May 24 and July 18. SES 1 at 3, 6 and 8 pounds per acre resulted in 48, 67 and 77 percent control of all broad and narrow leaf weeds to July 3. NPA gave 45 percent control in comparison to 27 percent control derived from the application of NPI at the 5 pound rate. The average density of weeds per plot, based on vigor and number was proportionate to weed count values only to mid season. The control effectiveness of the July 18 application was recorded 30 and 50 days after treatment. SES at 6 pounds per acre gave 80 percent control of all weeds, based on total weight of weeds per plot fifty days after application. NPA resulted in 70 percent control of weeds at the end of 50 days. NPI gave 50 percent control, which was comparable to the results derived from the application of SES at the rate of 3 pounds per acre. Hand labor was reduced by two-thirds in plots treated with SES at the 6 pound rate. Periodic observations indicated that no apparent injury was sustained by any of the plant materials utilized in this experiment. (Horticulture Department, Iowa Agricultural Experiment Station, Ames, Iowa.)

Further studies on weed control in conifer transplant beds. II. Mahlstede, J. P. Nine plots containing approximately 30, four year old seedlings of Thuja orientalis were treated with SES and N-1 naphthyl phthalamic acid (NPA) at the rate of 4 pounds per acre on April, May, June, July and August 8, 1952. The entire experiment was hand weeded, monthly, prior to each spray application, and top dressed with a soil-peat mixture known to contain a high weed seed population. Control of broad and narrow leaf weeds increased from 74 percent on May 8th to 89 percent on August 8th in plots treated with SES at the rate of 4 pounds per acre. Plots treated with NPA gave results ranging from 56 to 68 percent control from the May 8 to August 8 application. No apparent injury or growth inhibition was evident at the end of the growing season as a result of the application of either herbicide. (Horticulture Department, Iowa Agricultural Experiment Station, Ames, Iowa.)

The control of weeds in deciduous transplant beds. Mahlstede, J. P. Direct application of SES at the rate of 4 pounds per acre to establish deciduous stock in nursery transplant beds resulted in severe injury to the plants in trials carried on during the summer of 1951. In order to investigate a method which could be used to eliminate this difficulty trials in 1952 utilized a corn cob mulch previously immersed in a known concentration of SES applied in a 1 inch layer over established cuttings of Cornus stolonifera, and Ligustrum amurense. For this purpose 4 bushels of dry corn cobs were immersed in a water solution containing 12.754 grams of SES for a period of 24 hours. It was estimated that a one inch mulch would be comparable to a spray application of 6 pounds per acre. Six plots containing 128 rooted cuttings per plot were mulched with the treated cobs on June 19, 1952. Six plots containing a similar number of plants were mulched with a one inch layer of ground corn cobs soaked for 24 hours in water. 85 percent control of both narrow and broad leaf weeds was recorded on September 15th. No apparent injury was sustained by either Cornus or Ligustrum species in the treated plots. (Horticulture Department, Iowa Agricultural Experiment Station, Ames, Iowa.)

SUGAR BEETS

Summary — E. A. Helgeson

Pre-emergence treatments were reported in four of the six abstracts received. One experiment on pre-planting control and one on post-emergence was received. Unfortunately most of the abstracts did not distinguish between types of weeds controlled, nor was there an adequate coverage of environmental data. As in the past NaTCA was reported as generally effective on grasses except wild oats at rates from five to 15 pounds/A. One report on CaTCA indicated some toxic action on beets. In four reports on CIPC, grassy or general weed control was reported as good at rates of four pounds or more per acre. Three of these reports indicated stunting or reduction of stand at rates up to four pounds and severe to complete elimination of beets at higher rates. No injury was noted by Anderson in Canada even at rates up to 16 lb/A. Both Anderson and Nelson (pre-planting trials) reported excellent control of wild oats with CIPC and IPC at rates from three pounds up. The latter found these chemicals ineffective for later emerging weeds. One report rated PCP similar to five pounds TCA in effect on beets with a 32% weed control mixed with TCA injury to beets was enhanced with no increase in weed control. Two reports on EH2 gave in one instance no injury to beet and no grassy weed control whereas the second report indicated good weed control but some stunting of beets. Two reports on CMU indicated no injury to beets up to a two pound rate, but stand reduction at four pounds per acre. No satisfactory weed control was reported. One report on EH3890 indicated no injury up to 16 pounds per acre with some grassy weed control. Three workers reported on Endotahl. Two reported no injury to beets at rates up to 10 pounds whereas one report indicated about a 10% stand reduction at two and four pounds. One report indicated good Setaria control but no wild oat control, a second from 50 to 60% weed stand reduction and a third excellent broad leaf weed control but no effective grass weed control. Mixing with TCA increased injury to beets with no enhanced weed control. One report on xanthogen di-sulfide showed ineffective grass weed control and severe beet injury at the 20 and 30 pound rates.

Post-emergence trials were reported by one group only. Since this summary is stated clearly and briefly the reader is referred to the original by L'Arrivee and Andersen given below. Extensive trials at Fargo were a complete failure this year due to a severe drought followed by excessive rainfall.

All in all it is clear that there are too few reports at hand to permit of any clear cut generalization.

Abstracts of Results of Cooperators

Pre-emergence weed control in sugar beets. Bakke, A.L., D.W. Staniforth and D. B. Ogden. Sugar beets planted on April 29 were treated the same day with CMU at 0, 1, 2 and 4 lbs. per acre; TCA sodium salt at 0, 4, 8, 16 lbs. per acre; Endothal and chloro IPC at 0, 2, 4, 8 lbs. per acre. Four lbs. per acre CMU, 4 and 8 lbs. per acre of chloro IPC materially reduced the stand of sugar beets; otherwise there was no significant differences as determined by yields. There was little variation in the percent of sugar. The TCA sodium salt at 4 lbs. per acre gave the highest yield of sugar beets namely 19.4 tons per acre. Whereas the best of the controls having the usual cultivations was 17.1 tons per acre. (Contribution, Botany and Plant Pathology Section, Iowa Agricultural Experiment Station.)

Post-emergent treatment for the control of green foxtail and wild oats in sugar beets. L'Arrivee, J. C. M. and E. T. Andersen. The plots consisted of 4 rows of sugar beets alternating with 2 rows of green foxtail (Setaria viridis) and 1 row of wild oats (Avena fatua). All other weeds were removed by hand cultivation. Precipitation was excessively high previous to, and the day following the treatments. The results of the treatments with the chemicals and combination of chemicals can be grouped as follows: 1. Good control of both green foxtail and wild oats was obtained with endothal (EC3740) at 8, 12 and 16 lb/A; combinations of endothal plus EH5722 at 4 & 2 and 4 & 4 lb/A; and by combinations of endothal plus IPC at 4 & 4 and 4 & 8 lb/A. 2. Fair control of the green foxtail and excellent control of the wild oats was obtained with the combinations endothal plus CIPC at 4 & 2 and 4 & 4 lb/A. 3. Good control of the green foxtail only was obtained with endothal at 4 lb/A ; TCA, sodium salt, at 10 and 15 lb/A ; and the combinations of endothal plus TCA at 2 & 5 and 4 & 5 lb/A. 4. Fair control of the wild oats only was obtained with the 8 lb/A application of CIPC/ 5. Green foxtail and wild oats were unaffected by the 2½ and 5 lb/A treatment of dichloral urea (EH2). The combinations of endothal plus N-1 naphthyl phthalamic acid (1-6Q8) at 4 & 2, 4 & 4 and 4 & 6 lb/A caused crinkling of the beet foliage; the highest rate causing stunting of the sugar beet. None of the other chemicals caused injury to the sugar beets. (Contribution of Division of Plant Science, The University of Manitoba, Winnipeg.)

Pre-emergence Weed Control in Sugar Beets. Grigsby, B. H. Eight compounds and two mixtures of 2 compounds were applied 2 days before the expected emergence of sugar beets. Two rates of application were used in each case. Results were evaluated on the basis of percent reduction of beet stand and percent reduction of weed count as compared to untreated plots adjacent to each treatment. TCA at 5 and 10 lb/A had no effect on beets and reduced weed counts 33 and 52 %; endothal, 2 and 4 lb/A reduced beet stands up to 10% and weed counts 50 to 60%; CIPC, 2 and 4 lb/A had less than 10% beet reduction and 37 and 64% weed reduction; PCP, sodium salt, at 8 pounds gave the same results as 5 pounds TCA, at 16 lb/A beet stand was reduced 40% and weed emergence 64%. Combinations of TCA and endothal or TCA and PCP increased the injury to beets and did not increase the total weed kill at the rates used. Beet yields are not yet available for any of the treatments. (Contribution of the Michigan Agricultural Experiment Station and BPIS & AE, Division of Weed Investigations.)

Pre-emergence weed control in sugar beets. Ilnicki, Richard D., and Willard, C. J. This experiment was conducted at the Northwestern Substation of the Ohio Agricultural Experiment Station. Sugar beets were planted in 4-row plots, 30 feet long, 3 replications, on May 1, 1952 and treated May 4. The season was exceptionally dry, the seed-bed poor, and germination irregular, so that data are confined to observations. Treatments included both sodium and calcium TCA at 5, 7½, 10, and 15 lb/A ; dichloral urea (E.H. No. 2-73) and disodium 3,6-endoxohexahydrophthalate (Endothal 3003), eahc at 4,6,8, and 10 lb/A ; and 3-chloro-IPC at 1, 2, 4, and 8 lb/A , all applied in 40 gallons water per acre.

The TCA salts were the most effective materials used. Excellent control of Setaria lutescens at 10-15 lb/A 5 and 7½ almost enough. Some stunting of beets occurred at 15 lb but seedlings recovered 5-6 weeks after spraying. Both salts reduced stand at 15 lb/A but the calcium salt was slightly more toxic. Dichloral urea at 10 lb/A gave very good weed control and stunted beet seedlings, but the beets recovered normal size 5 weeks after spraying. Eight lb resulted in good weed control. Lower rates not too effective. 3-Chloro IPC at 8, 4, and 2 lb/A reduced the beet stand 100%, 75%, and 15%, respectively. Four and 8 lb/A resulted in very good to

excellent weed control while the lower rates were ineffective. One, 2, and 4 lb/A stunted the beets. The beets never recovered normal size. Endothal at 8 and 10 lb/A gave excellent control of broad leaves. Six lb resulted in good control of broad leaves. No rate was effective on grasses. (Contribution of Ohio Agricultural Experiment Station.)

Control of wild oats and volunteer grain in sugar beets with IPC. Nelson, Russell T. Fifteen trials were initiated in the spring of 1952 for the control of wild oats and/or volunteer grain in fields to be planted to sugar beets. Foul fields for tests were selected in irrigated districts at Longmont, Fort Lupton, and Fort Collins, Colorado; Wheatland, and Lovell, Wyoming; and Billings, Montana. Treatments included were IPC at 3 and 6 lbs/A and CIPC at 3 and 6 lb/A. All plots were one acre or more in size, with untreated check plots left beside each treated plot. All treatments were applied in aqueous emulsion at 10 gal/A with a low pressure weed sprayer prior to planting sugar beets. Immediate double-discing of field to incorporate the chemical with surface 4 inches of soil was requested along with completion of seed-bed and planting of sugar beets as soon as possible. Both IPC and CIPC at 3 and 6 lb/A rates gave good control of volunteer grain and wild oats, provided the chemical was mixed thoroughly with the soil and germination of foul growth occurred within a few days after application. The sugar beets tolerated the IPC treatments. Some delay in emergence was noted at 6 lb/A rate of IPC. The CIPC gave no better weed control than IPC, and was much more injurious to sugar beets. Beet stands were poor on many CIPC plots, however, no plot failed to the extent of requiring replanting. No direct effect of IPC or CIPC on yield or sugar percentage was shown in harvest results summarized from three different fields. Favorable benefit received from IPC in manner used was confined to the control of wild oats and volunteer grain. Broadleaf weeds and later germinating grasses (Setaria and Echinochloa) were not controlled by either IPC or CIPC as used in these tests. (Contribution from The Great Western Sugar Company, Agricultural Experiment Station, Longmont, Colorado.)

Summary — B. H. Grigsby

Three abstracts on the control of crabgrass in turf. Chlordane, PMA and KOCN were the only herbicides reported in these abstracts. Some pre-emergence treatments with PMA and KOCN were made but the major portion of the work was on contact applications.

Reports on chlordane were uniform in that little or no effect from this compound was observed when water was used as a diluent for the chemical. Chlordane, applied in a kerosene-type oil, is reported to give a 75% or better, kill of crabgrass. Bluegrass was not affected by the chlordane but fescue was injured by the heavier dosages reported. A range of 10-15 lbs./A was suggested as suitable for selective control of crabgrass.

One report indicated a 90-98% control of crabgrass from 3 applications of KOCN at 4½ and 6 oz. per 1000 sq. ft. Less burning was observed when the chemical was mixed with Milorganite and applied dry.

PMA Compounds, in the same abstract, are reported to be less effective than KOCN. Early applications, the 2-leaf stage, gave better kill of crabgrass but new seedlings developed in the plots 4 weeks after treatment.

The small number of abstracts makes the formulation of any regional suggestions impossible. The crabgrass problem throughout the region is important in home lawns, parks, golf courses, etc., and an intensified research program on crabgrass should be undertaken by the NCWCC.

Abstracts of Results of Cooperators

Effects of chlordane on crabgrass in turf. Grigsby, B. H. Chlordane at rates of 10, 15 and 20 lbs./A were applied to lawn plots in which Kentucky bluegrass and Chewings fescue were the chief types of grass. These rates of application were made with an emulsifiable concentrate (72%) and with a 50% wettable powder in refined kerosene and in water. All volumes were held to 1 gal/1000 sq. ft.

Applications were made in July, August and September in order to determine the effects of chlordane on crabgrass at different stages of growth.

In all plots where water was used as a carrier no control of crabgrass, nor injury to turf grasses was observed. When the oil-chlordane combination was used control, based on actual counts of surviving crabgrass, was at the 50% level or greater.

A rate of 15 lbs. gave 75-95% control without injury to bluegrass. Some burning of fescue was observed. The 20 lb. rate destroyed all crabgrass, caused some injury to bluegrass and killed all top growth of fescue. Both of these turf grasses recovered by the end of September. Crabgrass was killed at any stage of growth.

In a late season trial, a comparison of chlordane, PMA, and KOCN indicated that chlordane had less effect upon perennial turf grasses than did either of the other herbicides. (Mich. Agric. Exp. Sta. and Div. Weed Invest. BPIS&AE)

Chemical Control of crabgrass in turf. Lantz, H. L. Potassium cyanate applied as a spray with wetting agent at the rates of 4½ and 6 oz. per 1000 square feet - 2 and 3 applications gave 90 percent control. The most effective time of application was at the early and mid-season stage of seed head formation. At the two leaf stage, a complete kill was secured, but within a month new seedlings appeared which later on produced an abundance of seed.

Potassium cyanate powder was mixed with Milorganite. Two applications at the rate of 6 oz. of PC per application with 15 lbs. Milorganite produced 98 percent control and without the burning that follows the spray applications.

The phenyl mercury compounds, P.M.A.S. and Tat-C-Lect sprayed at the rate of 2½ oz. per 1000 square feet during the two leaf stage gave control somewhat lower than was achieved by P.C. None of the other herbicides gave satisfactory control, but there was a considerable reduction in the amount of crabgrass in certain of these treated plots as compared with the untreated plots.

Plots which were successfully treated in 1951 were badly infested in 1952. The reason for this probably lies in the fact that (1) the fairway mowers scatter seed from plot to plot, and (2) that viable seed more than one year old was present.

A series of early season pre-emergence plot treatments failed to produce any marked reductions in the population of crabgrass. (Ia. Agr. Exp. Sta. Ames. Ia.)

Response of crabgrass, in bluegrass turf to chlordane. Lee, Oliver C. Replicated plots, in a Kentucky bluegrass turf infested with crabgrass (Digitari ischaemum) were sprayed with chlordane using rates of 5, 10, 15 and 20 lb/A of actual chlordane in 160 gal/A of water. First crabgrass emergence occurred on May 5. To determine the effect of time of application, treatments were made May 1, June 1 and Aug. 1. Additional treatments of 30, 45 and 60 lb/A were applied on July 1. Slight burning of grasses resulted from the 20 lb. rates, the heavier rates caused severe burning. No apparent control of crabgrass has been observed with any of the rates applied at the times indicated above. Plots will be held over for observation in 1953. (Dept. of Botany and Plant Pathology, Purdue University, Lafayette, Indiana.)

Vegetation control with CMU and combination of pentaborate and sodium chlorate (chlorax spray powder). Anderson, C. J., Walter, C. Plots containing predominately bluegrass with mixture of timothy, lespedeza and red colver were sprayed with CMU at rates of 5, 10, 20, 30, 40 and 50 pounds per acre. Spray dates were May 15, May 29, June 16 and July 1. Average temperature was normal for the period of April through September, while average precipitation was slightly higher. Using a check plot at each interval, twenty pounds per acre completely controlled vegetation after one growing season on plots sprayed May 15 and June 16. Thirty pounds per acre completely controlled vegetation sprayed May 29 and July 1. Pentaborate and sodium chlorate were sprayed on plots containing same type of vegetation at rates of 110, 220, 440, 870, 1300 and 1740 pounds per acre. Spray dates were April 15, April 30, May 15, May 29, June 16, July 1 and July 15. Vegetation was completely controlled after one growing season at rates of 400 pounds per acre on plots sprayed April 15 and April 30. Vegetation was completely controlled after one growing season at 800 pounds per acre when sprayed on later dates.
(Iowa Ordnance Plant, Silas Mason Company, Burlington, Iowa)

DEFOLIANTS, DESICCANTS AND PRE-HARVEST WEED CONTROL

Summary

W. P. MacDonald

Legumes. Several workers reported on trials with DNSOBP, PCP, endothal, KOCN, and CMU at several rates with oil or water, or combinations of the two diluents. These chemicals were applied at one or more locations on alfalfa, sweetclover and red clover. In general, the best results were obtained with PCP and DNOSBP. In one case use of the latter chemical resulted in a seed yield increase of 10% over conventional harvest methods. According to those reporting, KOCN, endothal, and CMU did not produce satisfactory results. In the one case reported, sodium cyanamid produced satisfactory results on red clover and in this trial endothal speeded the maturity of the red clover but had little effect on weeds.

Soybeans. Two stations reported on the use of PCP, DNOSBP, concentrated sodium chlorate (Shed-A-Leaf) with and without TCA, and endothal for the desiccation and defoliation of soybeans. In general, PCP, DNOSBP and the concentrated sodium chlorate reduced the moisture content of the beans more rapidly than did natural maturity. Endothal was not considered effective. One worker reported that there is little likelihood that soybean maturity can be speeded up without seriously reducing yields.

Wheat, Oats and Barley. Sodium cyanamid was applied to wheat, oats and barley in cool weather and produced a color change in the fields within 24 hours. Moisture content of oats dropped rapidly with wheat and barley much slower. Endothal and sodium isopropyl zanthate did not produce satisfactory results in the crops named.

Corn. Sodium cyanamid and endothal failed to give moisture reduction significantly below naturally matured corn under conditions very favorable for natural drying.

Abstracts of Results of Cooperators

The use of sodium cyanamid (x5) 65 percent as a pre-harvest spray on wheat, oats and barley. Cooper, G. S. Strips containing 2 A of wheat, oats and barley were treated at Dewberry, Alberta, Canada, in late Aug., 1952. Sodium cyanamid (x5) 65 percent at 15 and 25 gal/A was applied in 18 gal of solution. Nonic 218 was added at the rate of 2 oz per hundred gal of solution. In all cases the treated grain took on an even golden color within 24 hours. The chemical was applied at very low temperatures 45 to 36° F and it was apparent that temperature is a prime factor in the effectiveness of the chemical. It was found that the moisture content of oats dropped very rapidly after treatment, provided warm weather followed. Wheat and barley moisture did not drop as rapidly and after reaching 19 percent did not fall lower until warmer weather occurred. It was noted that Garnet

wheat treated under cool conditions resulted in a dark translucent kernel which did not assume natural coloration until the moisture level dropped to 16 percent. Complete results of these tests will not be available until after all data have been gathered. Treated grain did not suffer the frost damage that untreated grain did at Dewberry this year. This matter will be given careful study in the next experiments in this region. (Cont. of the Ill. Agr. Exp. Sta., Urbana, Ill.)

The use of sodium cyanamid and endothal as pre-harvest sprays on corn. Cooper, G. S. Sodium cyanamid (x5) 65 percent at 15, 25 and 40 lb/A and endothal at 1½, 2 and 2½ gal/A were applied in 25 gal of solution per acre to plots of corn containing 2 dates of maturity. The chemicals were applied at 3 dates starting when the early maturing corn had reached a moisture content of 45 percent and the late maturing corn a moisture of 54.2 percent. The chemicals were applied August 29, September 4 and September 11, 1952. Sampling for moisture was carried out every 6 days following treatment until October 5, 1952. Twelve hills were harvested from each treatment on October 5 for yields and chemical analysis. The moisture drop in treated corn was most noticeable in the late maturing variety and was most evident 20 days after treatment. However, by the time safe storage levels of moisture had been reached only minor differences were found between the treated and untreated plots. The differences in moisture were only of the 2 to 3 percent range for the early maturing variety and 4 to 5 percent for the late maturing variety. However, owing to the excellent drying conditions which prevailed throughout this region this year it would be unjust to discard this practice as having no value until further tests can be completed under more unfavorable drying conditions. It is also indicated that a more complete kill of the stalk may be necessary before faster drying can be achieved, as was shown by the results obtained by applying pentachlorophenol 40 percent at 3 gal/A in 10 gal of fuel oil. The moisture difference between treated and untreated was 16 to 18 percent 30 days after application. Lighter rates did not give this difference. Chemical analysis will be available at a later date. (Cont. of the Ill. Agr. Exp. Sta., Urbana, Ill.)

The use of sodium cyanamid, endothal and sodium isopropyl zanthate as pre-harvest sprays on wheat and oats. Cooper, G. S. Sodium cyanamid (x5) 65 percent applied at 15 and 25 lb/A at the rate of 25 gal of solution per acre resulted in an even golden coloration of the straw and heads of wheat and oats in 3 days. The moisture content of the treated grain decreased only slightly faster than that of the check grain under the extreme summer temperatures and dryness experienced in 1952. Oats showed the greatest drop in moisture levels. There was considerable leaf damage to the companion clover crop but complete recovery took place within 3 weeks. Chemical analyses, etc., will be reported later. Endothal at 1½ and 2 gal/A applied at 25 gal of solution per acre resulted in a silver-gray straw and head appearance 3 days later. The moisture level dropped only slightly faster

than that of the check plots in this test. Complete killing of the companion clover crop was noted and no recovery was made. Lambsquarters were not affected in any way at these rates. Sodium isopropyl zanthate at 8 and 12 lb/A applied in 25 gal of solution is not effective as a top killer at this rate of solution. At least 80 gal of solution are needed before satisfactory top killing is achieved. In all the above chemical treatments the sticker Nonic 218 was used at the rate of 2 oz per 100 gal of water. (Cont. of the Ill. Agr. Exp. Station, Urbana, Ill.)

The effect of pre-harvest spraying on the seed yield of Buffalo alfalfa. Phillips, W. M.; Casady, A. J.; Franklin, W. W. A 45-acre field of Buffalo alfalfa was sprayed with 1.25 lb of DNOSBP in 10 gal diesel oil/A applied by airplane. Before spraying the field, a series of 12 plots was laid out and were divided into six pairs. One plot of each pair was mowed, wind-rowed, and later harvested with a pick-up attachment on a combine. The remaining six plots were sprayed and combined while standing. The weather conditions following the spray applications were very favorable for drying the sprayed foliage. Also the hot dry weather was favorable for drying the hay and seed in the wind-rows. The standing plots were combined 48 hours after treatment. The mowed and wind-rowed plots were picked up immediately following the direct combining of the standing plots. The same combine was used for both series of plots. In all six replications, the direct combining resulted in the higher seed yield. The average yield of the mowed and wind-rowed plots was 339.3 lb/A and the average of the sprayed and direct combined plots was 377.1 lb/A or an average difference of 37.8 lb. The differences between the various replications ranged from 6.3 to 63.0 lb/A. The above seed yields represent cleaned alfalfa seed. (Cont. by Div. of Weed Investigations, BPISAE, USDA and the Fort Hays Branch of the Kns. Agr. Exp. Sta., Hays, Kansas.)

Pre-harvest use of several chemicals for drying and maturing of seed alfalfa. Phillips, W. M.; Casady, A. J.; Franklin, W. W. The following chemicals were used in this experiment: DNOSBP at .6, 1.2 and 1.8 lb/A applied in 5 and 10 gal diesel fuel/A and in oil-water emulsions; PCP at 4 and 6 lb/A in the above carriers; KOCN at 15 and 25 lb/A plus a wetting agent; and endothal at 4 and 8 lb/A plus a wetting agent. The latter two chemicals were not effective in drying the alfalfa foliage. DNOSBP and PCP both were satisfactory in drying the alfalfa for direct combining. Throughout the experiment the straight oil carriers were more satisfactory than the oil-water emulsions. All of the rates were effective when applied in 10 gal of oil. The 5 gal volumes gave rather erratic results and, in general, could not be accepted as effective treatments. Those treatments that were judged to be effective were considered ready to combine 36 hours after treatment. (Cont. by Div. of Weed Investigation, BPISAE, USDA, and the Fort Hays Branch of Kansas Agr. Exp. Station, Hays, Kansas.)

The effect of several chemicals on pre-harvest weed control and crop drying in sweet clover. Phillips, W. M.; Casady, A. J. The following chemicals were used in this experiment: DNOSBP, PCP, KOCN, monochloroacetic acid, two chlorate-borate mixtures, and endothal. These chemicals were applied in a number of different carriers and at different rates per acre giving a total of 36 treatments. The only chemicals which were effective were DNOSBP and PCP. Both of these chemicals appeared to be equally effective in drying the foliage and the weeds which were present. When applied in 10 gal diesel fuel/A, 0.6 lb of DNOSBP was not completely effective. When applied in 20 gal diesel fuel/A, the results were satisfactory. However, 1.2 lb gave a more complete kill. Oil-water emulsions were not as satisfactory as straight oil. The PCP at 4 and 6 lb/A was effective when applied in 20 gal diesel fuel/A. Emulsions consisting of 5 gal of oil in 15 gal of water were less effective. The other chemicals mentioned gave little or no drying of either the sweetclover or the weeds. Seed yields were not obtained but observations were taken concerning the shattering of sweetclover seed. There appeared to be no undue shattering for a period of 5 days. At that time an extremely strong wind caused nearly all of the seed to shatter. (Cont. by Div. of Weed Investigation, BPISAE, USDA and the Fort Hays Branch of Kns. Agr. Exp. Sta., Hays, Kansas).

Pre-emergence, post-emergence, and pre-harvest application of CMU on corn, flax, soybeans, and alfalfa. Robinson, R. G.; Wiese, A. F.; Anderson, L. E.; Dunham, R. S. The following observations are reported on the basis of only one year's trial. Further investigations are planned. Pre-emergence applications on corn at 2 and 4 lb/A gave good control of annual weeds all season but injured corn. Soil applications of 2 lb/A at lay-by gave excellent weed control. Pre- and post-emergence applications on flax at 2 and 4 lb/A resulted in some selective removal of wild mustard, foxtails, and wild oats. Yields of flax from pre-emergence and early post-emergence applications were equal to weed-free checks. Pre-emergence applications on soybeans at 1 and 2 lb/A gave fair weed control. Post-emergence applications as low as 0.5 lb killed soybeans. As a pre-harvest drying spray, 2 lb in various carriers was less effective than dinitro-defoliants on soybeans, alfalfa, and corn. (Cont. from the Div. of Agron. & Plant Genetics, Univ. of Minn., St. Paul, Minn. Paper No. 2926, Sci. Jour. Series, Minn. Agr. Exp. Sta.)

Chemical drying of soybeans and weeds with airplane spraying. Shafer, Neal E. Pre-harvest spraying of Lincoln soybeans drilled at a 7 in spacing was also carried out at a third location. The same high volume equipment on an Aeronca Champion was used. Beans were nearing maturity as indicated by mostly brown pods. Green leaves and stems persisted, however, as well as a heavy stand of annual smartweed, and Acnida spp. Moisture conditions were quite dry as the result of 26 days without rain. Treatments applied Sept. 27 gave the following results when sampled 3 days later, Sept. 30:

	Percentage moisture	
	Soybeans	Weeds
1 gal Shed-A-Leaf in 5 gal H_2O/A	17.45	65.70
1 gal Shed-A-Leaf in 8 gal H_2O/A	23.52	66.80
3 gal Shed-A-Leaf in 5 gal H_2O/A	20.90	64.84
1 gal Shed-A-Leaf + 5 lb TCA in 5 gal H_2O/A	21.18	64.35
Untreated Check Sept. 27	43.02	67.50
Moisture trends of untreated soybeans and weeds		
Sept. 27	45.16	64.79
Oct. 2	41.56	65.63
difference	-3.60	+0.84

Moisture trends show soybeans were continuing to mature but no such change was occurring in the weeds. Shed-A-Leaf was a new liquid concentrate of sodium chlorate furnished by Chipman Chemical Co. It appeared to give the lowest percentage moisture in soybeans of any chemical or formulation except 2 qt PCP which is reported elsewhere. (Cont. of the Dept. of Agron., Neb. Agr. Exp. Sta., Lincoln, Neb.)

Chemical drying of soybeans and weeds with airplane spraying. Shafer, Neal E. Pre-harvest spraying of drilled soybeans (7 in spacing) was done using an Aeronca Champion mounted with high gallonage equipment. The Lincoln variety of soybeans was used. Bean pods were dry and brown but the stems and lower leaves were green at the time of spraying. Treatments applied Sept. 27 were as follows with resulting effect on moisture content Sept. 30:

	Soybeans	Weeds
Endothal - 2 qt + 2 oz activator in 5 gal H_2O/A	26.76%	66.00
Shell 130 - 5% PCP 5 gal/A (undiluted)	23.64	55.73
Dow General - 2 pt in 5 gal diesel oil/A	22.40	56.28
Shell 130 - 5% PCP 8 gal/A (undiluted)	24.53	59.48
Dow General - 1 pt in 8 gal diesel oil/A	35.21	62.53
Endothal - 4 qt + 2 oz activator in 5 gal H_2O/A	34.50	65.90
Moisture trends of untreated soybeans & weeds:		
Sept. 27	39.34%	69.22
Sept. 30	32.00	70.00
difference	-7.34	+0.78

Weed species in descending order of occurrence were, Acnida spp (often called smooth pigweed) annual smart weed, volunteer corn, and lambsquarters. All plots were combined 8 days after spraying. Endothal was not effective in drying weeds at either rate. Observations 3 days after spraying indicated sufficient drying to permit direct combining of all plots except endothal. Soil and weather conditions remained dry throughout the experimental period. (Cont. of the Dept. of Agron., Neb. Agr. Exp. Sta., Lincoln, Nebraska).

Chemical drying of soybeans and weeds with airplane spraying. Shafer, Neal E. Pre-harvest spraying of drilled (7 in spacing) Lincoln soybeans was done at a second location using high volume equipment mounted on an Aeronca Champion. Bean pods were grey to brown in color but considerable green remained in the stems and lower leaves. A heavy growth of annual smartweed covered about

1/3 of all sprayed plots. Acnida spp., barnyard grass, and lambsquarters also occurred in the field although in lesser numbers. Soil moisture and humidity were both low as the result of 26 days without rain. Treatments applied Sept. 27 gave the following results when sampled Oct. 2:

	Percentage moisture	
	Soybeans	Weeds
1 qt PCP in 8 gal diesel oil/A	29.81	63.53
1 qt PCP in 5 gal diesel oil/A	39.44	68.07
2 qt PCP in 5 gal diesel oil/A	17.66	61.56
2 qt Endothal + 5 lb TCA in 5 gal H_2O/A	36.63	65.04
Moisture trends of untreated soybeans and weeds:		
Sept. 27	45.16	64.79
Oct. 2	41.56	65.63
difference	-3.60	+0.84

The moisture trends point out the continuing maturation of the soybeans but emphasize the lack of such drying of the weed growth. Note the lack of effective drying of the weeds by any of the treatments. This is primarily the result of the high moisture content retained in the stems of the annual smartweeds even though all leaves were dried up. Increasing volume to 8 gal did not improve results as much as increading chemical used. (Cont. of the Dept. of Agron., Neb. Agr. Exp. Sta., Lincoln, Nebraska).

Pre-harvest sprays for soybeans. Slife, F. W.; Cartter, J.L. Water base and oil base chemicals were applied to weed-free soybeans at 5 dates of application to study rate of moisture loss. The water base chemical used was endothal at 1½ gal/A and the oil base chemical was 1 qt of Dow General dissolved in 10 gal oil/A. These chemicals were further diluted in water and applied at a rate of 25 gal of total solution/A. Applications were made with a high clearance sprayer. Chemicals were applied at 4-day intervals when the soybeans were in the following developmental stage: (1) 1 percent leaves turned yellow, (2) 8 percent leaves turned yellow, (3) 75 percent leaves turned yellow, (4) 40 percent leaves dropped, (5) 100 percent leaves dropped. Two check plots were included, a non-treated check and a hand-defoliated check. Check plots were included with each chemical treatment date. Moisture level in the stems, leaves, pods and beans was taken at 4-day intervals and continued until the beans on all plots had dropped enough in moisture to be safe for storage. Although yield and moisture level data are not yet calculated the following conclusions seem obvious: (1) Yield reductions at stage I treatment will be approximately 25 percent with beans of very low quality. (2) There will be some yield reduction at stage II treatment but not as severe as stage I. (3) There seems to be little difference between the water base and oil base chemicals insofar as rate of moisture loss is concerned even though the water base gave excellent leaf drop while the oil base chemical "froze" the leaves on the plants. (4) It appears from this study and a similar study conducted last year that there is little possibility in materially speeding up the maturity of weed-free soybeans without seriously reducing the yields by the use of chemical defoliants. (Cont. of the Ill. Agr. Exp. Sta. & USDA Regional Soybean Laboratory, Urbana, Ill.)

Pre-harvest sprays for red clover. Slife, F. W. Although red clover acre seed yields are low in Illinois, this state produces a large amount of seed each year. A standard practice in red clover seed production is to mow the clover down and after drying, pick up with combines. Frequently rains interfere with this practice and make it impossible to get a large amount of the seed in the windrow. If chemicals could be used to dry the clover standing it would eliminate the weather hazard. In 1952 the following chemicals at the indicated rates were used for this purpose: NIX at 8, 10, and 12 lb/A, PCP at 3, 4, and 5 gal of a 5 percent concentration per acre, Dow General at 1 pt and at 1 qt in 10 gal of oil/A, endothal at 1, 1½ and 2 gal/A and sodium cyanamid at 10 and 20 lb/A. The check plots included a mowed check as well as a standing check. Moisture samples were taken at 2-day intervals after treatment and continued until 5 samples had been taken. Weather following treatment was ideal for this study with bright sun and temperatures of 85° F. The heaviest rate of all chemicals was effective in drying up the red clover so that it could be combined in 4 days after treatment. The standing check was not ready for combining because of green basal growth for 1 month after other plots had been treated and the mowed check was dry enough for combining 8 days after mowing because of no rain. PCP and Dow General were particularly effective in drying up various weeds present in the field. Endothal seemed to be particularly effective in drying up the red clover even at the lowest rate of application. Germination tests are being run on the red clover seed from treated plots. (Cont. of Ill. Agr. Exp. Station, Urbana, Illinois)

NEW HERBICIDES

Summary

W. C. Dutton

This summary covers 11 so-called new herbicides, none of which, however, are really new. They are all in experimental and developmental stages and with limited or no commercial use. The materials included in this summary are here listed with the number of reports received for each indicated in parentheses. Octachlorocyclohexenone (1), beta naphthoxyacetic acid (1), 4-chlorophenoxyacetic acid (2), trichloroacrylate (3), maleic hydrazide (6) sodium isopropyl xanthate (5), sodium 2,4-dichlorophenoxy ethyl sulfate (14), 3,6-endoxohexadydrophthallic acid (20), N-1-naphthyl phthalamic acid and imide (21), isopropyl-N-(3-chlorophenyl) carbamate (25), 3-p-chlorophenyl-1-1-dimethylurea (51).

No abstracts are published in this section as they are all supposed to have been sent for use in some other project. This may mean that a few reports were sent to New Herbicides only and thus will not be published. A few of this type were referred to other projects and it is unfortunate if a few are not published.

An index to these materials is included in the front of this report.

Octachlorocyclohexenone (1 report) was used over ten direct seeded vegetables. There was no injury or stand reduction with tomato, beet, radish, lima bean, snap bean and sweet corn. Stand was reduced with lettuce, spinach, carrot and onions. This is apparently a contact material with little or no residual effect and gives about the same weed control as Stoddard Solvent. Beta naphthoxy acetic acid (1) used on seedling alfalfa in oats permitted a normal stand and both physical factors (wetting) and activity are indicated as important. 4-Chlorophenoxyacetic acid (2) gave results like beta naphthoxy acetic acid on seedling alfalfa but on established alfalfa caused formative effects and reduced yield but was less toxic to alfalfa than 2,4-D or MCP. Trichloroacrylate (3) gave no control of leafy spurge at 40 lb./A; was ineffective in spring applications at 80 lb./A on quack grass and Russian knapweed but gave fair control in fall treatments.

Maleic hydrazide (6) in pre- and post-emergence treatments on peas at 3, 6 and 9 lb./A gave good weed control and caused no injury to peas. Maleic hydrazide applied to quack grass which was soon plowed under gave very interesting indications. Crops seeded on treated areas were normal. It stopped growth of Johnson grass for 8 weeks and greatly modified the new growth but did not kill seedlings. Radish responded to various MH treatments with pronounced effect on foliage and roots, regrowth in storage and pod and seed development. Sodium isopropyl xanthate (5) is apparently a contact material with little residual effect. In one instance it gave poor results in pre-emergence treatments in onions at 16 lb. with generally poor control of all species but seems to be safe and effective in onions as a contact pre-emergence application. Pre-emergence treatment to direct seeded tomatoes of 12 lb. with 3 lb.

TCA gave 93% control of grasses with no effect on stand or yield of tomatoes. Post-emergence directed sprays in onions gave very ordinary results. Pre-emergence applications to 12 direct seeded vegetables on silt loam and muck gave satisfactory stands and no injury with tomato, beets, radish, carrots, lima and snap beans, sweet corn and potato but results were erratic on lettuce, spinach, turnip and onion. Broadleaves were well controlled but grass control was poor.

Sodium 2,4-dichlorophenoxy ethyl sulfate (14) was used with several crops. Onions seem to be definitely sensitive at effective rates. Peas were not affected with 6 lb. but two applications of 4 lb. reduced yield. An emergence application of 2 lb. reduced yield of snap beans and 4 lb. caused some injury to sweet potatoes. Sweet corn, potato and asparagus have reasonably good tolerance. 4 lb. conifer transplant beds caused no injury, 6 lb. on crushed corn cobs in nursery transplant beds caused no injury, 6 lb. gave no injury in an established nursery, 6 lb. caused no reduction of yield or sucker growth of raspberries and a generally good weed control program in strawberries resulted in some reduction in runner count but not in yield and other work indicates that strawberry yields are not reduced by moderate reduction in runner count.

Endothal (3,6-endoxohexahydrophthallic acid)(20) was studied in a wide variety of uses as here indicated and with many conflicting results. The outstanding indication reported is that it gave fair to good control of wild oats. Control of broad leaves was fair to good with pre-emergence applications. Annual grass control was variable but usually good with 4 to 6 lb. A directed post-emergence spray of 2 lb. in onions gave fair broadleaf control but with little effect on grasses. There was little effect on quack grass with 32 lb. in a spring treatment but the same amount in the fall on fall plowed land gave fair results. Onions were usually reported to be injured by endothal in pre-emergence treatments. Tomatoes were severely stunted by 4 lb. and the single report on flax indicated delayed maturity and reduced stand and yield. Peas and beets were reported as not injured by endothal. Excellent results in weed control in newly planted cherry orchards was obtained with two applications. Trees were not injured and growth was increased. Attempts to eradicate scrub oak were not successful and an April application was not satisfactory for keeping forest fire lanes open. An attempt to keep down weed competition in young forest plantations emphasized the importance of soil type. Ten and 20 lb./A gave excellent control of both broadleaves and grasses (not quack) on loam soil but gave little or no control of either on sand and muck. Endothal was not satisfactory for drying soy beans with heavy weed populations.

N-1-naphthyl phthalamic acid and imide were used rather extensively (21). There seems to be definite indications that the acid is more active herbicidally than the imide but the imide is safer with sensitive crops. Crop tolerance is not clearly indicated but muskmelons seem to tolerate both the acid and imide very well, the acid, at effective rates was safe on soy beans and peas and reasonably safe on burley tobacco. Yield of onions was reduced with post-emergence treatments of both the acid and the imide while a

pre-emergence application of acid was safe but ineffective. The acid seems to be safe on peas, doubtful on tomatoes. The imide is much the safest on sweet potatoes and both gave fair to good weed control in an established nursery without injury. Weed control results were variable but there were many instances of good to excellent control as in soy beans, peas, muskmelons, nurseries, etc.

Chloro IPC (isopropyl-N-(3-chlorophenyl) carbamate)(25) was used extensively. Four of the 25 reports indicated good to excellent weed control without ill effects on crops. These included crabgrass in several crops and was indicated as the most promising chemical used; pre-emergence on onions gave good weed control and again was the best treatment used; weeds in sweet potatoes and weed control in newly planted cherry orchards. Eight reports indicated little or no injury to the crop with at least fair weed control or control of one type of weed. These crops included soy beans; sugar beets (wild oats controlled, foxtail not controlled); 14 vegetables with fair to adequate control with margin of safety rather narrow, soy beans with grasses and smartweed controlled but other broadleaves not; onions in which there was good control of smartweed but none of pigweed, forest fire lanes with poor broadleaf control but promising for grasses; young forest plantings with good control of grasses and fair control of weeds in corn. In other instances slight to severe injury or stunting developed with sugar beets (two reports), seedling alfalfa, burley tobacco, peas (post-emergence), carrots and tomatoes. On the other hand safe use with no weed control or with no data on weed control was reported for onions (post-emergence), peas (post-emergence) and snap beans. Attention is called to the apparent high degree of specificity or unusual effect in some cases such as good control of grasses and poor control of broadleaves, good control of smartweed and none of pigweed and indication of value against wild oats.

CMU (3-p-chlorophenyl-1-1-dimethylurea) was the most extensively reported of the so-called new herbicides with 51 reports. The large number of reports and the wide variety of uses make it difficult to prepare a concise summary. It was very evident in the reports on its use in crops that its effectiveness was usually stated simply as "weed control" which was not broken down into "broadleaves" and "grasses" as was usually done with most compounds. A listing of results follows. CMU was used in several trials in onions with the rather definite indication that onions on muck frequently tolerate 2 lb./A very well although 1/2 lb. reduced stand in one instance. The yield of carrots was slightly reduced by 1½ lb. and more by 2 and 2½ lb. There was total kill of direct seeded tomatoes from pre-emergence applications of 1 and 2 lb. Vegetables in general show marked differences in tolerance. Lettuce, tomatoes, turnips, snap beans, cucurbits and brassicas are reported as very susceptible to even small amounts; sweet corn was slightly affected by 1 lb. and potatoes, beet, and spinach had fair tolerance to 2 lb. Peas were not injured with 1 and 1½ lb. Weed control in vegetables on mineral soil was generally good to excellent with 1 lb. and more but 2 lb. was generally indicated as a reasonable minimum for good weed control in muck grown vegetables and grass control was poor in one instance at 3 lb.

Burley tobacco was severely stunted by post planting application of 1 and 2 lb. and slightly by 1/2 lb. Soy beans were not injured under very dry conditions by 4 lb. but with some rain 1, 2 and 4 lb. reduced stand 13, 30 and 80% respectively; all in pre-emergence treatments. One-half pound in a post-emergence application killed soy beans. Other field crops show variable tolerance. In cotton 1/3 lb. caused slight yellowing, 2/3 lb. a little more and 1-1/3 lb. reduced stand and yield and in this same study peanuts and cowpeas were sensitive to even 1/6 lb. in pre-emergence treatments. Results reported on flax are confusing with statements of delayed maturity, reduced stand, increased yield, decreased yield, injury, no injury, etc. In wheat and barley, 2 lb. increased yield and 3 lb. gave severe injury to wheat. Barley is apparently more tolerant than wheat. The rate required for weed control in crops is not clearly indicated. One pound seemed to be a little low although even lower rates sometimes gave good control. Two pounds and more usually gave good to excellent weed control.

Quack grass control with CMU was studied extensively and there was good control with 20 to 25 lb. in several instances. Fall application on fall plowed land was much better than spring application and dosage is indicated as more important than cultivation with it. Johnson grass control was excellent in one case with 20 lb. or more and in another 60 lb. was necessary. Leafy spurge responded only to large amounts and then not with complete control. Bindweed responded well to 40 lb.

Several other special weeds were worked with. Wild oats responded fairly well to good to 2 and 4 lb. Wild barley was difficult to control with 6 lb. giving 86% control but with CMU being the best material used. Foxtail in flax was not controlled with 3 lb., horsetail was reduced 40% with 40 lb., 2 lb. gave 25% control of Russian pigweed, 80 lb. was ineffective in June against Russian knapweed but gave 80% control in the fall and there was no effect on purslane with 2 lb.

Scrub oak was well controlled when applied in various ways and it gave very promising results in maintaining forest fire lanes. Weed control in young forest plantings was excellent on sand and good on loam and muck but pine and poplar were killed on sand and loam while on muck the pines were slightly injured and poplars were uninjured.

CMU used as a sterilant, gave good and excellent results under power lines with 20 and 40 lb.; a high degree of sterility was maintained through two seasons with 25 lb. and more and in fence rows under rather arid conditions 40 lb. killed wheat grass, kochia, annual brome and puncture vine while 80 lb. was necessary for bindweed, blue grama and Russian thistle. Any one of several additives increases early toxicity in vegetation control but differences disappear in 30 days with more than 20 lb. of CMU.

BASIC STUDIES

Summary

W. E. Loomis

Wisconsin and Iowa workers present additional evidence that wetting agents increase the rate of penetration of herbicides, even of the esters. A greater rate of penetration would be expected to reduce the effects of rain shortly after treatment, to increase toxicity and perhaps to decrease differential action. We have evidence in Iowa that about half of the difference in toxicity between amines and esters is due to the lower surface tension of the ester sprays as commonly used.

The addition of quick acting toxicants to 2,4-D reduces the translocation of the latter compound. Conc. 2,4-D sprays have some of the same effect. Translocation is apparently limited to living tissues, and dependent upon available carbohydrates. It would be interesting to know whether the effect of carbohydrates is that of a carrier or an energizing action.

Volatility of 2,4-D is still an important question. 2,4-D sprays are prohibited in the Wash. State grape areas, and all commercial grape vineyards in western Iowa showed 2,4-D injury this year. Some apparently from spraying more than a mile away. At the recommended rates we suspect that drift is more important than volatility. Wetting agents tend to increase drift by decreasing drop size.

Abstracts of Results of Cooperators

Absorption of 2,4-D by corn inbreds. Behrens, R. and K. P. Buchholtz. The differential responses of corn inbreds to 2,4-D may be due to variations in the rate of 2,4-D absorption or to differences in the total amount of 2,4-D absorbed. To investigate possible variations, a study of corn leaf retention and absorption of 2,4-D was made in 1951. Inbreds 375, M-14, 23 and 22 were treated by dipping the leaves in 2,4-D solutions with a detergent added to give uniform leaf coverage. After treatment leaf samples were collected immediately, as soon as the solution had dried on the leaf surface, and 4 and 8 hours after dipping. The 2,4-D was washed from the leaf surface immediately after sampling. Quantitative measurements of the amount of 2,4-D stripped from the leaf surface were made by use of a wheat root inhibition test. The results indicated that the rate of 2,4-D absorption was very rapid while the solution was drying on the leaf surface. The data on 2,4-D absorption by inbred 375 indicated that the greater response after 2,4-D treatment exhibited by this inbred, on the basis of stalk curvature, may be due to the absorption of a greater total amount of the chemical. However, differences in the total amount of 2,4-D absorbed did not explain the differential responses of other inbreds that were studied. Total absorption of 2,4-D was .096, .050, .068 and .052 mg. per 100 sq. cm. of leaf surface for inbreds 375, M-14, 22 and 23 respectively. Based on stalk bending responses, inbreds 375, M-14, 22 and 23 were classified as susceptible, resistant, resistant and intermediate respectively. Similar studies made on the rate of 2,4-D absorption by the 4 inbreds, indicated that the responses shown by 375 and M-14 might be associated with the rate of absorption, but this was not true for inbreds 22 and 23. The results indicate that the rate and total amount of 2,4-D absorption may account in part for the differential responses shown by corn inbreds but other factors are also involved. (Dept. Agronomy, Univ. Wisconsin, Madison.)

Physical factors affecting the toxicity of herbicides to alfalfa. Dorschner, K. P. and K. P. Buchholtz. Plots of oats 6 by 12 ft. in size seeded to Ranger alfalfa were sprayed with amine salts of 2,4-D, MCP, 2,4,5-T, B-naphthoxyacetic acid (Beta) and 4-chlorophenoxyacetic acid (4-Chloro) at 0.25, 0.5 and 1.0 lbs acid equivalent per acre in water equal to 20 gal/A. Four replicates were used. Spraying was done when the alfalfa was from 5 to 6 inches tall and when the oats was about 12 inches high but not yet in the boot stage. On July 29 the grain was harvested and the stubble clipped and raked. On Sept. 15 the alfalfa plants were counted in 3 two sq ft quadrats on each plot. The table shows that check plots averaged 16.2 plants per 2 sq ft. Plots treated with 2,4-D and MCP had significantly less plants than check over all rates of application. 2,4,5-T reduced stands significantly below check at only the 1.0 and 0.5 lb rates. Stands on plots treated with Beta and 4-Chloro were equal to check at all rates.

Herbicide	Lb/A	Alfalfa plants/2 sq ft	Spreading coef.
2,4-D	1.0	0.2*	-48.32
	0.5	3.3*	-52.71
	0.25	5.9*	-59.63
MCP	1.0	1.3*	-55.41
	0.5	3.4*	-62.32
	0.25	8.0*	-63.44
2,4,5-T	1.0	1.1*	-33.39
	0.5	4.7*	-40.59
	0.25	13.6	-48.80
Beta	1.0	14.8	-31.60
	0.5	16.3	-42.54
	0.25	16.0	-51.41
4-Chloro	1.0	16.2	-52.86
	0.5	16.1	-67.84
	0.25	16.2	-74.00
Check	---	16.2	

The apparent toxicity of any herbicidal solution is probably a function of both the retention and absorption of spray particles and the molecular toxicity of the chemical to plant tissues. The former effects are influenced by the interfacial characteristics of the individual droplets on plant leaves and by their wetting properties. After a determination of their contact angles and surface tensions spray solutions can be compared on the basis of their spreading coefficients. The closer the coefficient approaches zero the more completely will the leaf surface be contacted and it is assumed that the more toxic will the herbicidal solution appear. To determine the spreading coefficients of the spray solutions used, measurements were taken against glass slides coated with paraffin. Results are listed in the table. Since the coefficients of MCP are greater than those of 2,4-D, at least part of the apparent reduction in toxicity, as measured by plant stand, should be ascribed to this characteristic. On the other hand the reduced toxicity of 2,4,5-T in comparison to 2,4-D must be due to a reduced toxicity of the molecule, for the coefficients of 2,4,5-T are less than those of 2,4-D. The reduced toxicity of 4-Chloro is probably in considerable part due to its poor wetting and spreading characteristics. (Dept. of Agron., Univ. Wisconsin, Madison.)

Penetration of 2,4-D compounds. Hauser, Ellis W. Penetration of 2,4-D compounds was studied by spraying soybean plants at the unifoliate leaf stage with 2,4-D and washing the plants in a series of detergent and rinsing solutions after varying intervals. Reductions in the new growth two weeks after treatment were considered as being directly proportional to the chemical absorbed. The sodium and dimethylamine salts of 2,4-D were sprayed at conc. of 100 and 75 ppm respectively and the plants were washed after exposures of 7, 15, 30 and 60 min. There were no significant yield reductions from a 60 min. exposure with the sodium salt, while the same exposure gave a significant penetration of the amine. When surface active agents were added (0.5%), significant yield reductions at the .01 level followed a 30 min. exposure for the sodium salt and 15 min. exposure for the amine. Conc. of 1,000 ppm of the sodium salt and 750 ppm of the amine were used with exposures of 4, 7, and 15 min. There was no appreciable penetration of the sodium salt, while the amine penetrated in 7 min. When wetting agents were added to the conc. solutions, exposures of 4 min. to the sodium salt and amine residues resulted in significiant yield reductions. The isopropyl ester of 2,4-D sprayed at a concentration of 50 ppm, penetrated in 7 min. The addition of wetting agents increased penetration of the ester form also. (Dept. of Botany and Plant Path., Iowa State College, Ames.)

Effect of 2,4-D in combination with soil and foliage applications of complete fertilizer on the yield of barley, flax, alfalfa and rape. Zalik, Saul. Montcalm barley, Redwing flax, Argentine rape, and Ferax alfalfa plots were each divided into three main plots. One plot received a soil application of 18 lbs./A. of a complete fertilizer in lime as a spreader, another received a foliage spray of fertilizer of the same composition, and the third received no fertilizer. The soil applications were made two weeks before the first date of 2,4-D application, and the foliage sprays were applied one day before the first date of 2,4-D treatment. The rates of 2,4-D applied, and the dates and stages of growth at the time of application were: barley 3, 6 and 12 ounces/A, applied June 18 (6"), June 25 (12-14"), July 3 (18-20"), and July 12 (4 days before heading); flax 3 and 6 ounces/A. applied June 18 (3-4", about 12 leaves), July 13 (12"); alfalfa 3 and 6 ounces/A applied June 18 (1", one trifoliate leaf); rape 3 and 6 ounces/A. applied June 18 (5-6 leaves), and June 25 (8-10 leaves). The yields were based on threshed grain for barley and flax, and on green weight of plant material for alfalfa and rape (cut August 11). There were no significant differences in yield of any of these crops that might be attributable to fertilizer application, or to a combination of fertilizer and 2,4-D applications. Statistically significant reductions in yield of barley were obtained for the 6 and 12 ounce rates of 2,4-D. The reductions were most severe for the July 12 date of application. Statistically significant reductions in yield of flax were obtained only for the 6 ounce rate, but highly significant reductions in yield of alfalfa and rape were obtained for both the 3 and 6 ounce rates. In the case of rape, applications of 2,4-D on June 18, resulted in markedly greater reductions in yield than for applications made on June 25. (Dept. of Plant Science, Univ. Alberta, Edmonton.)

Translocation of 2,4-D and carbohydrate supply. Young, D. W. Soybeans grown in the light that received a 2,4-D treatment on one half of one primary leaf, died when placed in the dark. Beans placed in the dark 24 or 48 hours before treatment and kept in the dark after treatment did not die although their growth was reduced. Beans placed in the dark before treatment showed no 2,4-D effect until returned to the light or treated with a sugar solution. Plants placed in reduced light or darkness before treatment and returned to light after treatment showed greater translocation of 2,4-D than plants kept in the light before treatment. Plants placed in the dark before treatment then dipped in a sucrose solution and

treated with 2,4-D one hour later and kept in the dark showed no 2,4-D effects. Similar plants trested with 2,4-D and then the sucrose solution showed effects of 2,4-D. (Dept. Bot. and Plant Path., Iowa State Col., Ames.)

The effect of phytotoxic agents and temperature on the translocation of 2,4-D. Young, D. W. 2,4-D solutions from 100 to 10,000 ppm were applied to one half of one primary soybean leaf and translocation of the 2,4-D was measured by the suppression of the terminal growth of the bean. No translocation of 2,4-D occurred with concentrations above 500 ppm in a solution containing 0.5 percent of toxic wetting agent. When a similar concentration of a non-toxic wetting agent was used, 2,4-D was translocated in the plant in proportion to the concentration of 2,4-D. Translocation was not observed when aromatic oils or contact weed killers were used with the carriers of 2,4-D, or when plants were held at 40°F. after treatment. Translocation of 2,4-D from the treated area was sufficient after 4 hours contact at 70°F. to significantly reduce the subsequent growth of the plant. (Dept. Bot. and Plant Path., Iowa State Col., Ames.)

Effect of 2,4-D on yields of inbreds, single crosses and double crosses of Ky 203 corn in the generation after treatment. Josephson, L. M., J. R. Hansen, and J. F. Freeman. Inbreds and singles of Ky 203 were treated with the alkanolamine salt of 2,4-D in 1950, pre-emergence at rates of 1.5 and 3 lb/A. Post-emergence applications of 0.4 and 0.6 lb/A were applied at two growth stages on other plots when inbreds were 8-10 in. and 36 in. high and singles were 21 and 55 in. high. All inbreds were selfed and crosses were made between inbreds and single crosses reciprocally for testing in 1951. Seed from selfed inbreds and crosses was planted in randomized complete blocks with five replicates. There were significant differences in total stands among 2,4-D treatments within inbreds and crosses. This was more pronounced in some of the inbreds. There were 1 to 2% more abnormal plants in the progeny of corn previously treated with 2,4-D. Length of time from planting to tasseling and silking was the same in plants from both treated and untreated seed. It was not possible to detect a consistent reduction in yield due to 2,4-D treatment the year previous. Of the mean yields over all lines and crosses for the six 2,4-D treatments, three were less and three were greater than the untreated check. While two rates of 2,4-D were applied at each of three stages of growth, the higher rate for each of the three treatment dates caused no yield decrease in comparison with the lighter rate. (Kentucky Agric. Exp. Sta., Lexington.)

Effects of soil, seed, foliage, and root applications of maleic hydrazide on the development of radish. Howat, M. G., W. G. Corns, R. J. Hilton. The experiments consisted of two parts: I. greenhouse studies, II. field trials. I. Maleic hydrazide (Naugatuck MH-40) was applied at 30, 20 and 10 lb. active ingredient per acre as a soil treatment to Cincinnati Market Radish, planted May 13; only a few plants from all three treatments managed to exist for one month. Scarlet Globe radishes planted May 22 in quadruplicate plots were used as follows: (a) seed was soaked in 1% MH for 2 hrs.; 0.2% 2 hrs., 0.02% 2 hrs., and 0.01% 1/2 hr.; (b) foliage sprays at market size: 4.0, 2.0, 0.5 and 0.1 lb./A/ (c) root applications at market size: 10, 4, 0.5 and 0.1 lb./A. Germination and growth from 1.0 and 0.2% seed ttmts. were slow and weak, and plants did not develop normally. Initiation of flower stalks was inhibited most by foliage ttmts. of 4 and 2 lb. In general, the hypocotyl development was hindered most by the strongest seed and foliage applications. Top development was retarded by 1% seed ttmt., 4.0 and 2.0 lb. foliage ttmt., and 0.2% seed ttmt., in that order. When plant tops were removed and root samples from each ttmt. were placed in cold storage, the regrowth of tops from the stronger foliage, root and seed ttmts. was markedly reduced. The regrowth

of roots from the hypocotyl was most reduced by 0.1 lb. foliage ttmt. and 4.0 lb. root ttmt. At the end of the storage period, dynamometer readings were made to test the firmness of the hypocotyl. Resistance to puncture measured in this way was significantly greater in three of the four foliage treatments. II. A field trial was planted May 26 in quadruplicate 12-ft. rows. The Scarlet Globe radishes were treated with MH just before market size was attained (July 1) and when plants were in 50% bloom (July 25) in foliage applications at 8.0, 4.0 and 0.5 lb./A, and in root applications at 20, 10 and 4 lb./A. Early foliage ttmts. of 4.0 and 2.0 lb. promptly arrested growth. New but weak flower stalk development resumed. Blooming was delayed for over three weeks and late maturity followed. Foliage ttmt. at 8.0 lb. prevented seed formation, and foliate ttmt. at 4.0 lb. resulted in a small yield of light seed. Total fresh and air-dry weight of these plants was approximately 40% of the controls in each case. Little difference was observed between the effect of later foliage ttmts. at 8.0 and 4.0 lb., but both greatly reduced flower and pod formation. Pods grew abnormally large in diameter, set few seed, and colored and ripened earlier. Very little more than the shrunken seed-coat remained following late foliage ttmt. at 8.0 lb. Only 20% of the seeds from late foliage ttmt. at 4.0 lb. were plump. Total air-dry weight of the plants from these two ttmts. was 42% of the control. These experiments show pronounced effects of maleic hydrazide on (1) foliage development, (2) root development, (3) regrowth of roots and tops in storage, (4) pod and seed development. Further investigation on the possibilities for using MH in the ecological control of certain annual weeds appears to be warranted. (Dept. of Plant Science, Univ. Alberta, Edmonton.)

Volatility of 2,4-D esters. Gillies, A. and J. C. R. Warren. A new radioactive isotopic tracer technique has been used in conjunction with the transpiration method to obtain the following values for the vapour pressure of 2,4-D esters at 25°C (x 10^{-3} mm Hg): Ethyl 11.5, Isopropyl 10.5, n-Propyl 7.2, n-Butyl 4.5, n-Pentyl 3.0, n-Hexyl 2.1, Butoxyethyl 1.7, n-Heptyl 1.35, n-Butyl 2,4,5-T 2.0. If these are corrected for the actual 2,4-D content and Butyl 2,4-D = 100 used as the basis, the following values are obtained for the relative amounts of 2,4-D volatilized: Methyl 283, Isopropyl 244, n-Propyl 167, n-Butyl 100, n-Pentyl 64, n-Hexyl 42, Butoxyethyl 33, n-Heptyl 26, n-Butyl 2,4,5-T 46. Field tests wherein materials in petri dishes were exposed indicated that (1) technical esters cause more damage by volatility than esters purified by fractional distillation (2) base oils used in formulating the esters may increase or decrease the volatility to different degrees depending on the base oil and on the ester used, and (3) when emulsified in water these volatility relationships may again be altered. (Dominion Rubber Res. Labs., Guelph and Naugatuck Chemicals, Elmira, Ontario.)

Drift and volatility of 2,4-D under field conditions. Young, D. W. Volatile and low volatile esters of 2,4-D were applied to vegetation at 2, 6 and 10 pounds per acre in 60 gals of oil or water carriers. Tomato plants were placed 20 feet from the edge of the sprayed area to determine drift and volatility effects. Wind velocities on the test days were between 5 and 6 miles per hour and the spray was released 3 feet above the ground at a pressure of 30 psi. In each of the 3 tests drift was increased when oil was used as the carrier. In only one case of the 2 and 6 pound rates was 2,4-D effect noticed. This was on the downwind side with the volatile ester at 2 pounds and the low volatile ester at 6 pounds per acre in oil. At the 10 pound rates in one test both esters in oil affected the tomatoes on the downwind side. There was, however, no effect when water was used as the carrier. In another test at the 10 poundrate the low volatile ester in water affected only the tomatoes on the downwind side while the low volatile ester in oil and the volatile ester in both oil and water affected the tomatoes on both sides

of the treated area. Before the end of the season the affected tomatoes recovered enough to set fruit and no injury was noticed on a soybean field 50 feet from the treated areas. (Dept. Bot. and Plant Path., Iowa State Col., Ames.)

The effect of light on mixtures of 2,4-D and carotene in solution. Behrens, R., K. P. Buchholtz. It has been suggested that carotene might play a role in the photodestruction of auxin and similar compounds. To determine if such a reaction occurs with 2,4-D, alcoholic solutions of carotene and 2,4-D were exposed to light from a 150 watt incandescent bulb. Original concentrations in exposed solutions were 5.4 and 2.0 ppm, respectively. 2,4-D concentrations in exposed solutions were determined by measuring the inhibition of wheat seedlings in solutions of suitable dilution. The concentration of carotene was determined by use of colorimeter. The results indicated that the activity of 2,4-D was not reduced when mixed solutions of 2,4-D and carotene were illuminated. Solutions of 2,4-D alone showed moderate but significant increases in activity after an exposure to light for a period of 100 hours. In mixtures of carotene and 2,4-D the activity of the 2,4-D was not increased, indicating that carotene prevented the activation of 2,4-D by light.

When water-alcohol solutions of carotene and 2,4-D, with concentrations of 0.46 and 0.30 ppm, respectively, were used the carotene, photodestruction proceeded more rapidly than when alcohol alone was used as the solvent. At the end of 9 hours exposure the carotene concentration in water-alcohol solutions containing carotene alone was reduced from 0.46 ppm to 0.08. However, in mixtures of carotene and 2,4-D the rate of carotene destruction was reduced so that 0.23 ppm or about 3 times as much remained at the end of the 9 hour period. The carotene content of similar solutions kept in the dark dropped only 0.01 ppm in the 9 hour period. This work indicates that 2,4-D partially protects carotene from photo-oxidation in water-alcohol solutions. No evidence was found that carotene plays a role in the photodestruction of 2,4-D. (Dept. Agron., Univ. Wisconsin, Madison.)

Studies on germination requirements of certain weedy crucifers. Steinbauer, G. P. and Peter Frank. Seeds of several members of the mustard family were collected at different stages of maturity and checked at intervals from time of harvest as to dormancy and light and temperature requirements for germination. Seeds used were from plants of Brassica nigra, B. arvensis, B. campestris, Sisymbrium officinalis, S. altissimum, Thlaspe arvense, Lepidium campestre, L. apetalum, Camelina microcarpa, Barbarea vulgaris, Arabis glabra, Berteroa incana, Capsella bursa pastoris, Erysimum cheiranthoides, Radicula palustris, and Raphanus raphanistrum. The seeds were subjected to constant 20°C., 25°C., 30°C., alternating 20-30°C. and in light and darkness at the a bove temperatures. Seeds not germinating at any of the above conditions were considered dormant.

Conclusions: (1) All seeds were more or less dormant at harvest, the dormancy persisting from a few weeks to several months; (2) With few exceptions temperatures above 25°C. were unfavorable for germination; (3) The alternation of 20°C. (18 hrs.) and 30°C. (6 hrs.) was, in most cases, superior to constant tempreatures, and for certain seeds absolutely necessary; (4) Exposure to light was either stimulative or inhibitory depending on kind and age of seed; (5) Dormancy is primarily a coat characteristic in these seeds, and removal of the coats or corrosion with acid made germination possible under a wide variety of conditions. (Mich. Agric. Exp. Sta., East Lansing.)

The effect of aqueous extracts of green plant tissue on germination and seedling growth. Le Tourneau, Duane, G. D. Faile s and H. G. Heggeness. Seeds of wheat and peas were germinated in water extracts of aerial portions of 24 species from 16 plant families. Extracts from all plants reduced percentage germination, length of roots and coleoptiles of wheat, and root length of peas. Inhibition varied with the species extracted, and increased with increasing amounts of material extracted. Preliminary experiments indicated that leaf extracts caused greater inhibition than stem extracts. Dilute extracts reduced root growth of wheat while higher concentrations inhibited germination and coleoptile growth. Reduction of root length in peas was accompanied by root swellings and secondary roots. Determinations of pH and total solids indicated that the inhibition was not due to pH or osmotic pressure but rather to substances present in these extracts. The nature and possible utility of these materials are being studied. Species tested for inhibitory activity were:

Ambrosia trifida	Iva xanthifolia	Plantago lanceolata
Asclepias syriaca	Lychnis alba	Polygonatum spp.
Avena sativum	Lycopersicon esculentum	Polygonum persicaria
Chenopodium album	Malva rotundifolia	Portulaca oleracea
Cucurbita maxima	Nepeta cataria	Soja max
Euphorbia esula	Petroselenium hortense	Solidago spp.
Hibiscus trionum	Phaseolus vulgaris	Triticum vulgare
Cirsium discolor	Pisum sativum	Zea mays

(Div. Plant Path. and Agric. Bot., Univ. Minn.; supported by grants from Graduate School, Univ. Minn. Paper no. 2920 of the Sci. Jour. Series, Minn. Agri. Expt. Sta.)

MECHANICAL CONSIDERATIONS

Summary — R. E. Larson

The several abstracts, submitted for inclusion in this section, as dealing with the mechanical problems of weed control cover a wide field. The variety of topics is such that it is impossible to write a summary which would combine the findings of such investigations. Therefore the abstracts are listed below to serve as a guide to the investigation results which are contained herein:

Cultivation of mulch planted corn (Bateman)
Studies on primary tillage, herbicide, applications and fertilizer applicators (Collins, Lovely)
Studies on the use of 2,4-D spray and flame applications as substitutes for mechanical cultivations in field corn (Lovely, Collins)
Ridge planting compared with listing using several herbicides at various rates to control weeds (Lovely, Staniforth, Collins)
Ridge planting as compared to surface planting with various herbicides used to control weeds (Lovely, Staniforth, Collins)
Determining spray droplet size (Pickard, Benfield)
Air-blast sprayer performance studies for applying herbicides on woody brush (Roth).

Abstracts of Results of Cooperators

Cultivation of mulch planted corn. Bateman, H. P. Preliminary studies in the problems encountered in cultivating mulch planted corn were begun in 1952. Corn was planted with the International Harvester experimental mulch planter in cover crops of stand over clover and early oats. The partially killed cover crop interfered with the use of sweeps for the first cultivation. Sweeps were replaced with disc hillers, two on each side of the row. In small corn both discs were set to throw away from the row. In taller corn the front disc close to the row was set to throw outward, the second one set farther out was adjusted to throw earth into the row where it covered the small weeds just emerging. These hillers so adjusted gave satisfactory results. Subsequent cultivations could be made with conventional sweeps. (Contribution of Agricultural Engineering Department, University of Illinois.)

Studies on primary tillage, herbicide, applications and fertilizer applicators. Collins, E. V. and Lovely, W. G. Corn was hill-dropped on May 3 on Webster Complex soil in 16-row plots. The following primary tillage methods were used: Conventional (plowing followed by disk and spike-tooth harrow prior to planting), plowing (plowing without secondary tillage prior to planting), listing (plowing followed by planting with a lister-planter), and ridging (plowing followed by ridge maker and planter). Each of the 16-row primary tillage plots was split into 8 fertilized and 8 unfertilized rows and each of these was split into 4 sprayed and 4 unsprayed rows. All treatments received 3 mechanical cultivations. Commercial fertilizer was applied as follows: 167 lbs/acre of 3-12-12 at planting time and 175 lbs/acre of 20-0-0 following the 3rd cultivation. Amine salt solution of 2,4-D was applied at planting time at the rate of 2 lbs acid equiv/acre in 15 gal of water. Stand and yield data were taken from the 2 center rows of each sub-sub-plot. Stands were significantly reduced on listed and ridge-planted plots. Physical and mechanical difficulties encountered while performing the 1st cultivation accounted for part of this stand reduction. Yield analysis showed that these primary tillage methods reduced yields by a significant amount even when the

adjusted mean yields were used. Excessive coverage of the corn plant slowed down the normal growth and tended to reduce yields. As expected fertilizer applications increased yields for all tillage methods. In all cases except where plowing was used as a primary tillage method and fertilizer was applied the pre-emergence spray treatment increased yields by a significant amount. Within each tillage method weed control was improved through the use of pre-emergence spray. Plowing without secondary tillage followed by the 3 normal cultivations gave weed control and yields that were equal to those obtained when the conventional method of primary tillage was used. (Contribution of Dept. of Agri. Engr., Iowa Agri. Exp. Sta. cooperating with Div. of Farm Machinery, Bur. of Plant Ind., Soils, and Agri. Engr., U. S. Dept. of Agri.)

Studies on the use of 2,4-D spray and flame applications as substitutes for mechanical cultivations in field corn. Lovely, W. G. and Collins, E. V. Corn was hill-dropped on May 2 in 42" rows on Clarion-Webster soil in 6-row plots. 2,4-D amine applied at the rate of 2 lbs acid equiv/acre in 15 gal H_2O on May 3 was used as a pre-emergence treatment. Overall coverage or sheet spray was compared to spraying in 10½" strips directly over the row. Corn was not cross-cultivated and check plots received 3 normal mechanical cultivations. The spray treatment was substituted for the 1st and for the 1st and 2nd cultivations as well as used in addition to 3 normal cultivations. Flame weeding when the corn was 2 in high and at 12 in high was substituted for the 1st cultivation. Following the 3rd mechanical cultivation (just prior to tasseling) 2,4-D amine was applied at the rate of 2 lbs acid equiv/acre with and without the use of drop pipes. Stands were not affected by any of the treatments. Analysis of the data shows that pre-emergence applications with strip and overall coverage and flame weeding at 12" height were successful substitutes for the normal 1st mechanical cultivation. Weed control was very good on these plots and when herbicides were used there were fewer weeds than found in the check plots. Flaming at 2" height and using only the 3rd cultivation with the pre-emergence spray significantly reduced yields. Overall spraying was better than strip spraying when the 1st and 2nd mechanical cultivations were eliminated. Post-emergence treatments seriously damaged the corn plants and significantly reduced yields. Plots sprayed with drop pipes tended to produce larger yields than those sprayed without drops; however, the statistical analysis showed no significant difference in yields and inspections showed no improvement in weed control. Pre-emergence spray, both strip and overall, plus 3 mechanical cultivations produced nearly weed-free plots but showed no significant increase in yields. (Contribution of Division of Farm Machinery, Bur. of Plant Ind., Soils and Agri. Engineering, U. S. Dept. of Agri., and Dept. of Agri. Engr., Iowa Agri. Exp. Station.)

Ridge planting compared with listing using several herbicides at various rates to control weeds. Lovely, W. G., Staniforth, D. W., and Collins, E. V. Corn was drilled on May 28 in 40" rows on Monona soil in 2-row plots. Listing, the conventional method of primary tillage in this area, and ridge planting, which is fundamentally listing and planting on the ridges, were used as tillage methods. Applications of 2,4-D amine, 2,4-D ester, and SES were made at planting time and at emergence (June 6) using 0:1 and 2 lbs acid equiv/acre as rates. All plots received 2 mechanical cultivations; the normal 1st cultivation being eliminated. Inspections and weed weights taken during the season indicated that amines and esters gave very good control of weeds while SES gave very little control. The analysis of the yield data showed no significant differences between tillage treatments, herbicides, rates or time of applications. Some interesting trends were evident. Ridge planting tended to increase yields over listing. 2,4-D amine applied at planting time at the 1 lb and 2 lb/acre rates tended to increase yields over the same

applications made at emergence. Applications of 2,4-D ester at the 1 lb/acre rate were as effective in controlling weeds as the 2 lb/acre rate and there were no differences in resulting yields. The SES gave very poor control of weeds and yields from these plots were slightly lower than checks. Weeds were not a serious problem in this experiment; however, inspections made following the final cultivation indicated that better control was obtained on the listed plots. During the early growing season the corn on the ridged areas appeared more mature than the corn on listed areas. The final yield results indicate that the listed corn was able to "catch up" during the latter part of the season. (Contribution of Division of Farm Machinery, Bur. of Plant Ind., Soils and Agri. Engineering, U. S. Dept. of Agri., and Dept. of Agri. Engr., Iowa Agri. Exp. Station.)

Ridge planting as compared to surface planting with various herbicides used to control weeds. Lovely, W. G., Stanforth, D. W., and Collins, E. V. Corn was drilled on May 10 in 42" rows on Webster soil in 2-row plots. Herbicides and pound rates were 2,4-D ester 0:1:2; 2,4-D amine 0:1:2; and SES 0:1:2. Herbicide applications were made at planting time and at emergence. Sprayed plots received 2 mechanical cultivations (the normal second and third); unsprayed plots received 3 normal cultivations. The first cultivation was done with a 1-row cultivator using sweeps on the surface-planted corn and a combination of sweeps and disk-hillers on the ridges. Second and third cultivations were performed with conventional 2-row cultivators using sweeps and disk-hillers. Ridge planting, which is fundamentally listing and planting on the ridge, was compared with plowing and surface planting, which is the conventional method in the area. Yield analysis showed no significant differences between yields obtained from either tillage method; however, surface planting produced slightly larger yields. Amine and ester formulations of 2,4-D gave good control of both grassy and broad-leaf weeds but the SES gave practically no control. Yields from sprayed plots were lower than the checks and the plots receiving 2,4-D produced significantly higher yields than plots receiving SES. Emergence applications of herbicides were more effective in controlling weeds and gave larger yields than planting time applications. In general, the 1 lb/acre herbicide applications were as effective as the 2 lb/acre rate; however, 2,4-D amine applied at emergence at the 2 lb/acre rate produced larger yields than the same treatment at the 1 lb/acre rate. (Contribution of Division of Farm Machinery, Bur. of Plant Ind., Soils and Agri. Engineering, U. S. Dept. of Agri., and Dept. of Agri. Engr., Iowa Agri. Exp. Station.)

Determining srpay droplet size. Pickard, George E. and Benfield, P. L. The ultimate aim of this project is to establish relationships between the drift of spray droplets and the factors affecting it during aerial application. The principal factors are droplet size, wind velocity, height and speed of the plane. Coated slides have been used at various times to catch spray droplets in order that they may be counted and measured. However, this method is not considered satisfactory for field use due to the loss by evaporation from the droplets before measurements can be taken. The present method permits catching the droplets in flat dishes containing a liquid of low surface tension and of specific gravity lower than the droplets to be caught. The droplets, being quickly immersed in the liquid are thereby protected from evaporation. Gasoline was found to be the most satisfactory liquid. The bottom of the glass dish is evenly coated with transparent nail polish which causes the droplets to retain their circular outline as viewed from above. Due to the difference in specific gravities, the droplet still spreads so a correction factor must be applied as described by K. R. May in The Cascade Impactor, an apparatus for sampling soil and liquid particle clouds. British Commonwealth Science Office. Porton report number 2463, pp. 1-7. The droplets are photographed at a magnification of x4, to be subsequently projected on a squared and calibrated

screen for measurement. Curves for droplet diameter, 2A vs focal length change, f, and for spread factor $\frac{f}{2A}$ vs correction factor, Y, permit determination of true droplet diameter from the measured diameter without individual determinations of focal length change, f. (Contribution of Agricultural Engineering Department, University of Illinois.)

Air-blast sprayer performance studies for applying herbicides on woody brush. Roth, Lawrence O. A study of the spray patterns produced by three commercial air-blast type sprayers showed that the machine best adapted to this work had a radial blade centrifugal type fan with air moving out tangential to the fan blades, short and straight ducts, and mounted to allow a quick directional change of the air stream. A machine of this type was used to apply herbicides on oak brush and trees varying the carrier volume, nozzle type, nozzle position, and pressure. The fan delivered 10,500 cfm of air at 13,200 fpm. Diesel oil carrier was applied at 5, 10, 15, and 20 gal/A. The nozzles were directed into and with the air stream and operated at 100 and 200 psi. Results showed that coverage was not affected by nozzle position or operating pressure. A full cone nozzle and a carrier rate of 15 gal/A gave the best coverage. The coverage was 80-90% in the first 40 ft of depth depending on the density of foliage. An experimental air-blast sprayer has been built incorporating compactness, clearance, and shielding to allow better maneuverability. Moving through brush still remains a problem unless a path is made first. Results to date indicate that the higher pressures (200-400 psi) and carrier rates (15-20 gal/A) give better coverage. Depth of spray penetration is 20-30 ft in dense foliage with good coverage. (Contribution of Agricultural Engineering Department, Oklahoma Agricultural Experiment Station, Stillwater, Oklahoma.)